

## **MAJOR FIELD OF STUDY “INFORMATION SYSTEMS AND TECHNOLOGIES”, MASTER OF SCIENCE, PERIOD OF STUDY 2 YEARS**

### **QUALIFICATION CHARACTERISTICS OF MAJOR FIELD OF STUDY "INFORMATION SYSTEMS AND TECHNOLOGIES" FOR EDUCATIONAL-QUALIFICATION DEGREE "MASTER" WITH PROFESSIONAL QUALIFICATION "MASTER OF INFORMATION SYSTEMS AND TECHNOLOGIES", PERIOD OF STUDY 2 YEARS**

The major field of study "Information Systems and Technologies" (IST) is from higher education area 4. Natural sciences, mathematics and informatics in the professional direction 4.6. Informatics and computer science. The training at this specialty for the Master's degree has a full time education form with a duration of 1 year (2 semesters). The graduates this specialty acquire the professional qualification "Master of Informatics".

Master's program corresponds to Vocational qualifications framework, developed by European education area.

The master's program corresponds of the developed framework for professional qualification in the European educational area. It outlines in detail the knowledge level and skills of graduate students, and their ability to cope with complex tasks.

The aim of the Master's program is to prepare qualified specialists in the field of IST, needed for both business, and science and society.

The specialty IST is with practical application. The curriculum includes compulsory basic courses providing basic multi-profile preparation in the field of information systems and technologies. Through elective courses, the students have opportunity to choose and enrich their knowledge and practical skills for specific areas of information technology and systems.

#### **Practices and internships**

The practical lessons that are included in the curriculum take place in the labs to Department - practical exercises to the compulsory and elective disciplines. In addition, students can participate in Erasmus+ mobility, which allows to get knowledge for European practices and to receive training for successful realization in international teams. They can participate in additional internships and practices in companies that are annual organized.

#### **I. Requirements for the professional qualities and competencies of accepted students**

For training at the specialty can applies persons who hold a Bachelor's degree / Master's degree in Informatics in professional direction 4.6. Informatics and computer science, specialty "Computer Systems and Technologies" in professional direction 5.3. Communication and computer technology, specialty "Mathematics" in professional direction 4.5. Mathematics, and specialty "Mathematics and Informatics" in professional direction 1.3. „Pedagogy of Teaching in...“.

## II. Requirements to professional skills and competencies of graduates the specialty

- SWU "Neofit Rilski" prepares qualified specialists at Informatics, and Information Technologies and Systems that can apply their knowledge and skills in science, culture, education and business life in Southwest Bulgaria, country and abroad.
- The Master's program prepares specialists who improve their knowledge in field of Information Systems and Technologies build on and expand knowledge and skills that are the basis for developing and implementing of new ideas. In training process, students receive in-depth knowledge in information processes and models area, modern technologies in computer science, use of different software, design, development and implementation of software products.
- **Learning highlights:** Modern data processing technology; Development of Web application; Security and protection; Software development technology.
- Students acquire following knowledge, practical skills and abilities:
- Development of modern software applications for computer systems with general and specialized use;
- using advanced technologies to design and study software applications;
- Application of program technology tools for databases design and implementation in different fields;
- Formation of affinity and ability for independently research and design activities;
- Basis for continuing education in the educational and scientific degree PhD;
- Good opportunities for realization in country and abroad;
- A way of thinking and affinity (openness) to the rapidly changing demands of the information society.

Masters graduates can work effectively both, independently and a team. They can make successful career as managers with in-depth analytical knowledge and skills at different levels of management in information technology field.

The Masters graduates at Informatics in information systems and technologies field can successfully realize as:

- 25196008 Coordinator IT Projects;
- 13305021 IT Center Manager
- 25116008 Computer Science Scientist
- 2310 Lecturers in higher schools
- 12233012 Head of Science Laboratory
- 1330 Managers in the field of information and communication technologies
- 13306001 Director, Information Systems
- 13306002 Director/ Manager, Information Technology
- 13306005 Head of Information Services

- 13306006 Manager, Computer Services
- 13306008 Head, Information and Communication Technologies
- 25116001 Systems analyst, information technology
- 25116002 Business Analyst, Information Technology
- 25145005 Head of a team of programmers
- 25146004 Database Management Systems Programmerанни
- 25216001 Analyst, databases
- 25216002 Database Administrator
- 25216003 Expert, database system software
- 25216004 Designer, databases
- 25216005 Programmer, databases
- 13306010 Manager, Software Applications
- 13306011 Manager, Software Development
- 21666003 Expert, prepress
- 21663006 Web designer
- 25116004 Designer, information systems
- 25116005 Business consultant, information technology
- 25196006 Analyst, Computer Quality Assurance
- 25196003 Information technology specialist, coordinator
- 25196004 Information technology planning specialist
- 25196005 Software testing specialist
- 25196007 Specialist training, software applications
- 25296001 Expert, security of information and communication technologies
- 25296002 Expert, information assurance
- 25296005 Data Security Consultant
- 3306012 Manager, Data Processing
- 13306014 Manager, Internet Supplies
- 24227065 Information Security Officer
- 24346001 Account Manager: Sales (Information and Communication Technologies)
- 25226003 Administrator, Information Systems
- 25126001 Expert, design and programming
- 25126002 Designer, software
- 25126004 Developer, software
- 25125006 Head of IT projects
- 25136002 Programmer, websites
- 25136004 Designer, web sites
- 25136005 Consultant, Internet programming
- 25136006 Developer, Internet Applications

- 25136007 Developer, PC games
- 25146001 Programmer, software applications
- 25143002 Specialist, application programming
- 25146003 Programmer, Business Management Systems
- 25296006 Specialist, data processing
- 25296007 Specialist, computer crimes
- 25296008 Data security specialist
- 35143001 Admin, Website
- 35143003 Webmaster
- 35143005 Website Management Consultant
- 35143006 Coordinator, website management, as well as in all spheres of public and economic life, where specialists in the field of informatics and information systems and technologies are needed.

### **III. Requirements to the preparation of the graduates**

The Master's degree graduates must have the following knowledge, skills and competencies:

- to conduct independent research, to model real processes and to create computer automated information systems.
- to use software packages to solve real business, engineering and management problems in uninterrupted and discrete macro systems.
- to participate in the development of basic software products and packages.
- to adapt and implement ready-made software products and systems.
- to solve problems with different application character in the software and the Internet space.

**Qualification characteristic of the major field of study "Information Systems and Technologies" for the Master's degree with a professional qualification "Master of Informatics" is a basic document, which determines the development of curriculum and curricula. It complies with the normative documents in higher education area in the Republic of Bulgaria.**

## CURRICULUM

FIELD OF STUDY: INFORMATION SYSTEMS AND TECHNOLOGIES,  
PERIOD OF STUDY: 2 YEARS (4 SEMESTERS)

First year

First semester	ECTS	Second semester	ECTS
<b>Compulsory Courses</b>		<b>Compulsory Courses</b>	
Introduction in Computer Programming	6.0	Databases	6.0
Introduction to IST	4.5	Web Content Management	4.5
Web Systems and Technologies	4.5	Applied Computer Mathematics	6.0
Internet Programming	6.0	Knowledge management	4.5
Protection of intellectual property	3.0	Optional 1 (Group I)	4.5
Computer mathematics 1	6.0	Optional 2 (Group I)	4.5
<b>TOTAL:</b>	<b>30</b>	<b>TOTAL:</b>	<b>30</b>
		<b>Optional Courses (Group I)</b>	
		(Choose two disciplines)	
		Graphic Design of Printed and Promotional Materials	
		Human Machine Interface Design and Analysis	
		Pattern recognition	
		Computer security	
		Internet technologies	
		Programming with VBA	
		Web Mining	

Second year

Third semester	ECTS	Fourth semester	ECTS
<b>Compulsory Courses</b>		<b>Compulsory Courses</b>	
Data mining	6.0	Business Process Management Systems	6.0
Component-Oriented Software Engineering	6.0	Application software for automatic translation	4.5
Semantic Web	6.0	Optional 5 (Group III)	4.5
Optional 3 (Group II)	6.0	Written State Exam or Graduate Thesis Defense	15.0
Optional 4 (Group II)	6.0		
<b>TOTAL:</b>	<b>30</b>	<b>TOTAL:</b>	<b>30</b>
<b>Optional Courses (Group II)</b> (Choose two disciplines)		<b>Optional Courses (Group III)</b> (Choose one discipline)	
JSP and Java servlet programming (Web programming)		Training at IT Company (Institution)	
Stochastic simulation		Natural language processing systems	
Applied Statistics		Information systems in bioinformatics	
Cloud technologies		Information Systems with Client-Server Architecture	
Applications of databases in bioinformatics			
Theory, Algorithms and Technologies for Speech Recognition			

**Language of Instruction: English.**

## DESCRIPTION OF THE COURSES

### Introduction in Computer Programming

**Semester:** 1 semester

**Type of Course:** Lectures and tutorials in computer lab.

**Hours per week:** 2 lecture hours and 2 hours tutorials in computer lab/FS

**Credits Number:** 6 credits

**Department:** Informatics

**Lecturer:** Prof. Daniela Tuparova, PhD

**Course Status:** core course.

**Course description:**

The course is first in area in programming for the students. The course includes topics related to syntax and semantics of programming languages, statements and operators in programming languages, arrays and functions. The course is based on the C++ programming language.

**Objectives:**

The student should obtain basic knowledge in area of programming and algorithms.

**Methods of teaching:** lectures, tutorials, discussions, project based method.

**Pre - requirements:** No

**Assessment and Evaluation**

Project- 50%

Final Test- 50%

**The course is successful completed with at least 51 % of all scores.**

**Registration for the Course:** No

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

Core

1. Милен Петров, Увод в програмирането (C/C++), Университетско издателство СУ „Св. Климент Охридски“, 2012
2. Азълов П., Ф. Златарова, C++ в примери, задачи и приложения, Просвета, 2011
3. Крушков Х., Програмиране на C++, 1 част - въведение в програмирането, 2012
4. Тодорова М., Програмиране на C++, 1 част, СИЕЛА, 2010
5. Тодорова М., и колектив, Сборник от задачи по програмиране на C++, Първа част, Увод в програмирането, Технологиика ООД, 2008
6. Презентации и код на програмите [dlearning.swu.bg](http://dlearning.swu.bg)

#### Additional

7. Скот Майерс, Ефективен C++, ИК „ЗестПрес“, София 2003
8. Денис Колисниченко. C / C++ - практическо програмиране в примери, Асеновци, 2017
9. John Keyser, Introduction to C++: Programming Concepts and Applications, Series: The Great Courses, Publisher: The Teaching Company, Year: 2019-08

#### On-line resources

URL <http://dlearning.swu.bg>

### Introduction to IST

**Semester:** 1 semester

**Type of Course:** Lectures and tutorials in computer lab.

**Hours per week:** 2 lecture hours and 1 hour tutorials in computer lab/FS

**Credits Number:** 4,5 credits

**Department:** Informatics

**Lecturers:** Prof. Daniela Tuparova, PhD

**Course Status:** Core course in curriculum of major Information Systems and Technologies, Bachelor degree.

**Course description:**



The course involves basic concepts as information, data, knowledge, information system, business information systems, hardware and software components of IS etc. The problems related to ICT jobs, copyrights and law issues in ICT.

**Objectives:**

The student should obtain basic knowledge in area of IT and IS:

**Methods of teaching:** lectures, tutorials, discussions, project based method.

**Pre - requirements:** No (Introductory course)

**Assessment and Evaluation**

Project- 50%

Final Test- 50%

**The course is successful completed with at least 51% of all scores.**

**Registration for the Course:** not required (core course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1. К. Манев, И. Ланджев, С. Малешков, Р. Стайнов, П. Асенова, С. Боев, Е. Стоилов, В. Фурнаджиев, Г. Тупаров, М. Райкова, М. Иванов, С. Генчев, М. Николова, Основи на информатиката, НБУ, 2017
2. Ralph M. Stair, George W. Reynolds, Fundamentals of Information Systems, Sixth Edition, 2012 Course Technology, Cengage Learning
3. BRIAN K. WILLIAMS,| STACEY C. SAWYER, Using Information Technology. A Practical Introduction to Computers & Communications, McGraw-Hill, 2011
4. URL <https://dlearningswu.bg>

## Web Systems and Technologies

**Semester:** 1 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 1 lecture hour and 2 labs hours per week/FS

**ECTS credits:** 4.5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslava Kraveva, PhD

**Course Status:** Compulsory Course in the Information Systems and Technologies in Master of Science Curriculum

**Short Description:** The proposed curriculum, issues and techniques in the field of modern web systems and technologies. Presented are techniques related to the construction of static and dynamic web pages, and their integration into comprehensive sites. Consider the following topics: Introduction to Web technology; Introduction to the language HTML. HTML document structure; Types of symbols and their formatting. Structuring and shaping of texts. Lists; Use of multimedia objects and formatting in HTML with CSS. Designing a logo; Creating and layout of tables with HTML and CSS; Working with containers. Positioning objects. Align Objects; Selection of colors. Color schemes. Fonts and Typography. Textures; Creating web forms; Hyperlinks. Maps of images. Anchors. Menus; JavaScript and JQuery. XML; Creating web graphics in a browser; Adaptive web design. Design Principles of the Web interface; Web services, blogs and social networks. Databases on the web; Semantic web and metadata.

**Course Aims:** The course aims to provide students with a comprehensive idea about the structure and capabilities of modern web technologies. Free to use the terminology and have practical experience in the development of static websites.

After completion of the course students should be able to:

- Use language HTML, DHTML, CSS, and through them to create Web sites;
- Knowledge of current development environments for the Web.

**Teaching Methods:** Seminars, demonstrations, exercises and project work.

**Requirements/Prerequisites:** Needed basic knowledge of information technology.

**Assessment:** Evaluating the student shall be carried out in the sixth grad scale. During the laboratory sessions the student receives n-assessments on current projects - CP<sub>1</sub>-CP<sub>n</sub> and protects the end of the semester individual course project - ICP. The final evaluation - FE is calculated as the average of those assessments and assessment received the ultimate test - UT, according to the formula:

$$FE = (((CP_1 + \dots + CP_n) / n + ICP) / 2 + UT) / 2$$

**Registration for the Course:** Not necessary

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

## References:

1. Bill Scott, Theresa Neil (2009) *Designing Web Interfaces*, O'Reilly Publishing
2. O'Reilly (2005) *What Is Web 2.0, Design Patterns and Business Models for the Next Generation of Software*, 09/30/2005, <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>
3. Ian Pouncey, Richard York (2011) *Beginning CSS. Cascading Style Sheets for Web Design*, Wiley Publishing
4. Jennifer Niederst Robbins (2012) *Learning Web Design, Fourth Edition, A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics*, O'Reilly Media
5. Leslie F. Sikos (2013) *Web Standards. Mastering HTML5, CSS3, and XML*, Apress
6. Brian P. Hogan (2009) *Web Design for Developers. A Programmer's Guide to Design Tools and Techniques*, The Pragmatic Bookshelf
7. Michael Bowers, Dionysios Synodinos, Victor Sumner (2011) *Pro HTML5 and CSS3 Design Patterns*, Apress
8. Benjamin LaGrone (2013) *HTML5 and CSS3 Responsive Web Design Cookbook*, Packt Publishing
9. Jason Beaird (2010) *The Principles of Beautiful Web Design*, SitePoint
10. Peter Gasston (2015) *The book of CSS3, 2nd Edition*, No Starch Press
11. Sandro Paganotti (2013) *Design Next Generation Web Projects with CSS3. A practical guide to the usage of CSS3 - a journey through properties, tools and techniques to better understand CSS3*, Packt Publishing
12. Antonio Pratas (2014) *Creating Flat Design Websites. Design and develop your own flat design websites in HTML*, Packt Publishing
13. Brian P. Hogan (2013) *HTML5 and CSS3. Second Edition. Level Up with Today's Web Technologies*, The Pragmatic Bookshelf
14. Mark D. Hawker (2011) *The Developer's Guide to Social Programming. Building Social Context Using Facebook, Google Friend Connect, and the Twitter API*, Addison-Wesley
15. W3Schools, <http://www.w3schools.com/>

## Additional Titles:

1. W3C: HTML 5.1 – <http://www.w3.org/html/wg/drafts/html/master/>
2. Aidan Temple (2013) *HTML5 2D. Learn how to develop a 2D HTML5 platformer that is capable of running in modern browsers*, Packt Publishing

3. Jason Gonzales (2013) *Mobile First Design with HTML5 and CSS3. Roll out rock-solid, responsive, mobile first designs quickly and reliable*, Packt Publishing
4. Lara Callender Hogan (2015) *Designing for Performance*, O'Reilly Media
5. Tom Barker (2015) *High Performance Responsive Design*, O'Reilly Media
6. Сайт с учебни материали по дисциплината „Практикум по уеб дизайн“-  
<http://timetable.swu.bg/lecture/rkraleva/LetenSem/WebDesign/yprWebDesign.html>

**Abbreviation:**

**FS:** Fall Semester

**SS:** Spring Semester

### Internet Programming

**Semester:** I semester

**Type of Course:** Lectures and tutorials in a computer lab.

**Hours per week:** 1 lecture hour and 2 labs hours per week/FS

**Credits Number:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Nadezhda Borisova, PhD

**Course Status:** A core course in the curriculum of major IST, Bachelor degree.

**Course description:**

The course is an introduction to the design and programming of Internet/Intranet Web-based information systems. A combination of JavaScript, CSS and MySQL/PHP/Apache technologies is considered in practical aspects.

**Objectives:**

The student should obtain knowledge of:

- Design and programming of Internet/Intranet Web-based information systems.
- Practical aspects of JavaScript, CSS and MySQL/PHP/Apache technologies.

**Methods of teaching:** lectures, tutorials, discussions, project-based method.

**Pre-requirements:** Database systems, Web design (core courses).

## **Assessment and Evaluation**

Project- 50%

Final Test- 50%

**The course is successfully completed with at least 50% of all scores.**

**Registration for the Course:** not required (core course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

## **References:**

1. McGrath, M. (2021). PHP in easy steps, 4th edition: For interactive websites - updated for PHP 8. United Kingdom: In Easy Steps.
2. Duckett, J. (2022). PHP & MySQL: Server-side Web Development. United Kingdom: Wiley.
3. PHP Notes For Professionals. (2023). (n.p.): Concepts Books Publication.
4. Nixon, R. (2021). Learning PHP, MySQL & JavaScript: A Step-by-step Guide to Creating Dynamic Websites. United States: O'Reilly Media.
5. Tatroe, K., MacIntyre, P. (2020). Programming PHP: Creating Dynamic Web Pages. (n.p.): O'Reilly Media.

## **Protection of intellectual property**

**Semester:** 1 semester

**Type of Course:** Lectures

**Hours per week:** 2 lecture hours

**Credits Numbers:** 3,0 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Manol Stanin, PhD

**Course Status:** Compulsory.

**Course description:** The discipline emphasizes the legal aspects related to the protection of intellectual property. Topics related to the essence, subject and place of the protection of intellectual property in modern technological relations and law, the stages of the historical development of the

protection of objects of intellectual property, as well as the various types of legal sources forming the right of intellectual property are examined. . Both the subjects and the objects of intellectual property law are studied. In the lectures, attention is paid to inventions, the patents with which they are protected, copyright as a way to protect works of science, literature and art, authorship of various types of software products and databases, digitization, various networks, software, computer programs, Internet piracy and e-commerce, etc.

### **Objectives:**

The course aims to give students basic knowledge in the field of intellectual property protection in a systematized form.

Methods of teaching: **lectures, discussions**

**Pre- requirements:** Introduction to IST

### **Assessment and Evaluation**

Tutorial - 70%

Final Test - 30%

**The course is successful completed with at least 51% of all scores.**

**Registration for the Course:** not required (core course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

### **References**

1. Каменова, Ц. Международно и национално авторско право, БАН, С. 2004.
2. Саракинов, Г. Авторско право и сродните му права в Република България, - 6. пре-раб. и доп. изд., Сиби, С. 2009.
3. Драганов, Ж. Право на означенията: марки, фирми, географски означения, домейн имена, Сиела, С. 2006.
4. Марков, Е. За титулите на интелектуалната собственост – в сб: Актуални проблеми на трудовото и осигурителното право. Юбилеен сборник в памет на професор Любо-мир Радоилски, Университетско издателство "Св. Климент Охридски", С. 2011.

## Computer mathematics 1

**Semester:** 1 semester

**Course Type:** lectures and lab exercises

**Hours per Week:** 2 lecture hours and 2 lab hours per week/FS

**ECTS Credits:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Ilinka Dimitrova, PhD

**Course Status:** Compulsory Course

**Course Description:** Computational Mathematics 1 (CM 1) is an up-to-date and useful scientific field - a set of theoretical, algorithmic and hardware programming tools designed to efficiently solve with the help of a computer mathematical problems with a high degree of visualization at each stage of the study of: sets and operations with them, elements of combinatorics, elements of analytical geometry - lines, planes, curves and surfaces of the second degree, elements of linear algebra – matrices, determinants, systems of linear equations, complex numbers and polynomials, functions of one variable. It aims to motivate and deepen students' knowledge of the possibilities of modern systems for computer mathematical calculations and visualization, as well as to build skills for independent modelling and solving applied mathematical problems using systems for mathematical calculations, providing speed, visibility and practical orientation of the course.

**Course Objectives:** Students should obtain knowledge and skills for computer solutions of mathematical problems using systems mathematical calculations.

**Teaching Methods:** lectures and lab exercises, discussions, practical work with mathematical computing systems WolframAlpha, Matlab, Mathematika, Maple, MathCad, Scilab, FreeMath, Maxima, Octave.

**Requirements/Prerequisites:** The assessment from current control is shaped by two control works developed using SCM, one course project and two home assignments. Students are admitted to the exam (written final test) minimum grade average / 3 / from current control. The final score takes into account the results of the current control (75%) and the score from the written exam (25%).

**Registration for the Course:** not necessary

**Registration for the Exam:** coordinated with lecturer and Student Service Department

**Abbreviation:**

FS: Fall Semester

## Databases

**Semester:** II semester

**Course Type:** lectures and exercises

**Hours (weekly):** 2 lectures and 2 exercises in computer lab / SS

**ECTS Credits:** 6.0 credits

**Course Status:** Compulsory course from the Curriculum.

**Department:** Informatics

**Lecturer:** Assoc. Prof. Velin Kraley, PhD

**Short Description:**

In the proposed curriculum, basic questions from the theory of "Databases" are considered, such as: conceptual model of databases - it includes the main tasks that solve the problems posed by the contracting authority; logical model of the database - includes the logical connections between the various data that are the basis of the developed database; physical model of the databases - represents their physical implementation (location, connections and information management).

**Teaching Methods:** lecture, discussion, exercises.

**Requirements/Prerequisites:** Knowledge in Mathematics and Programming.

**Exam:**

- Current control - 60% of the assessment
- Written exam - 40% of the grade

**Registration for the course:** Compulsory course

**Registration for the exam:** Coordinated with lecturer and Students Service Department

**References:**

*1) Basic*

1. Записки от лекции.
2. Павел Азълов. Базы от данни. Релационен и обектен подход, Техника, 1991 г.
3. Юлиана Пенева, Базы от данни. I част. София, ИК "Регалия" 6, 2003 г.
4. Ullman, J., Widom, J., DATABASE SYSTEMS The Complete Book (2nd ed), Upper Saddle River, 2009, New Jersey.



5. S. K. Singh. Sing Database Systems: Concepts, Design and Applications, 2009, Pearson India.
6. Rex Hogan. (2018) A Practical Guide to Database Design, CRC Press, USA.

## ***2) Additional***

1. Shepherd J.C. Database management: Theory and Application. Irwin Inc.,USA 1990.
2. Мейер Д.р Теория реляционных баз данных. Издательство "Мир". 1987.
3. Vidya Vrat Agarwal, Beginning C Sharp 5.0 Databases, 2012 New York Press.
4. Alapati and Bill Padfield, Expert Indexing in Oracle Database, 2011, New York Press.
5. Henry H. Liu, Oracle Database Performance and Scalability A Quantitative Approach, 2011 A Jon Wiley and Son, US.

### **Abbreviation:**

SS: Spring Semester

## **Web Content Management**

**Semester:** 2 semester

**Course Type:** lectures and labs

**Hours (weekly):** 2 lecture hours and 1 lab hour per week / SS

**ECTS Credits:** 4.5 credits

**Department:** Informatics

**Lecturer:** Chief Assist. Prof. Ivo Damyanov, PhD

**Course Status:** Compulsory course from the Information Systems and Technologies Master Curriculum – 2 years.

### **Short Description:**

Modern ways of organizing and building of content on the web - blogs, wikis, social media requires more organized content management. Integration of web sites with features from social networks and building shared content through various Web services are important elements of the management of any modern website. This course will examine the important activities related to the promotion of content through indexing and search engine optimization. Presented are theoretical methods based on formal concept analysis, adaptive ontologies and programming for the

organization of the structure and content sites. The course discusses specific systems for content management (CMS) - Sitecore, Umbraco, WordPress, Joomla and others.

**Course Aims:** To familiarize students with various activities tasks in content management and website building.

**Teaching Methods:** Lectures, Labs, Discussions, Project Based Methods

**Requirements/Prerequisites:** Knowledge in Programming Basics and HTML.

**Exam:** final exam

**Course enrolment:** *the course is compulsory*

**Registration for the exam:** Coordinated with lecturer and Students Service Department

**References:**

1. Deane Barker, Web Content Management, O'Reilly Media, Inc., 2016
2. Денис Колисниченко, Да направим собствен сайт, Асеновци, 2015
3. Тим Киберман, На първо място в Google - 2015, Франчайзинг БГ, 2015
4. Michael Kuhlmann, Social Media for Wordpress, Packt Publishing, 2012
5. Hawker, Mark D., The developer's guide to social programming : building social context using Facebook, Google friend connect, and the Twitter API / Mark D. Hawker, Addison-Wesley, 2010
6. Dan Zarrella, The Social Media Marketing Book, O'Reilly Media, 2009
7. Brad Williams, David Damstra, Hal Stern, Professional WordPress, 3rd Edition, Wrox Publishing, 2015
8. Петко Димов, SEO - Оптимизация на сайтове за търсещи машини, Diomira, София, 2019
9. John West, Professional Sitecore Development, Wrox Publishing, 2012
10. Alan Harris, Pro ASP.NET 4 CMS, Apress, 2010
11. Лари Улман, PHP и MySQL за динамични Web сайтове (обхваща PHP 5 & 7). Бързо ръководство, AlexSoft, 2019
12. Денис Колисниченко, Създаване на PHP приложения със Symfony, Асеновци, 2017
13. Nik Wahlberg, Paul Sterling, Umbraco User's Guide, Wrox Publishing, 2011

## Applied Computer Mathematics

**Semester:** 2 semester

**Course Type:** lectures and lab exercises

**Hours per Week:** 2 lecture hours and 2 lab hours per week/SS

**ECTS Credits:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Elena Karashtranova, PhD

**Course Status:** Compulsory Course

**Course Description:** Computerer mathematics 2 (CM 2) is a topical and useful scientific field - a set of theoretical, algorithmic and hardware programming tools designed to effectively solve with the help of a computer mathematical problems with a high degree of visualization at any stage of the study of integral and differential calculus, elements of higher algebra, number theory, analysis of algorithms. It aims to motivate and deepen students' knowledge of the possibilities of modern systems for computer mathematical calculations and visualization, as well as to build skills for independent modelling and solving applied mathematical problems using WolframAlpha and open source mathematical computing systems, providing speed, visibility and practical orientation of the course.

**Course Objectives:** Students should obtain knowledge and skills for computer solutions of mathematical problems using systems mathematical calculations.

**Teaching Methods:** lectures, discussions, independent work, practical work with mathematical computing systems WolframAlpha, Matlab, Mathematika, Maple, MathCad, Scilab, FreeMath, Maxima, Octave.

**Requirements/Prerequisites:** Students should obtain knowledge and skills of Computer Mathematics 1, Introduction in Information Systems and Technologies, Fundamentals of Programming, Web Systems and Technologies

**Assessment:** The assessment from current control is shaped by two control works developed using SCM, one course project. Students are admitted to the exam (written final test) minimum grade average / 3 / from current control. The final assessment takes into account the results of the current control (75%) and the score from the written exam (25%).

**Registration for the Course:** not necessary

**Registration for the Exam:** coordinated with lecturer and Student Service Department

**Abbreviation:**

SS: Spring Semester

## Knowledge management

**Semester:** 2 semester

**Type of Course:** lectures and labs

**Hours per week:** 2 lecture hours and 1 lab hour per week

**Credits Number:** 4,5

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Fundamental course from the Computer Science Master Curriculum.

**Course description:** The contents covered in this course have three major parts. The first part introduces the fundamental concepts of Knowledge Management, including what knowledge is about and Knowledge Management systems' life cycle. The second focuses on the knowledge creation and acquisition, and the third aims at the Knowledge Management system and implementation. Varied materials with respect to current published articles in KM related fields are added when necessary.

Fundamental concepts of Knowledge Management can be read from the book authored by Elias M. Awad & Hassan M. Ghaziri. Students are encouraged to pick up and find some self-interested papers from those listed below and read them in advance whenever possible during summer break. Basic objectives and tasks: The goal of the course is to prepare students to become familiar with the current theories, practices, tools and techniques in knowledge management, and to assist students in pursuing a career in the information sector for profit and not for profit organizations. In addition, students will learn to determine the infrastructure requirements to manage the intellectual capital in organizations. Specifically, at the end of the course students will be able to:

- Define KM, learning organizations, intellectual capital and related terminologies in clear terms and understand the role of knowledge management in organizations.

- Demonstrate an understanding of the history, concepts, and the antecedents of management of knowledge and describe several successful knowledge management systems.
- Identify and select tools and techniques of KM for the stages of creation, acquisition, transfer and management of knowledge.
- Analyze and evaluate tangible and intangible knowledge assets and understand current KM issues and initiatives.
- Evaluate the impact of technology including telecommunications, networks, and Internet/intranet role in managing knowledge.
- Identify KM in specific environments: managerial and decision making communities; finance and economic sectors; legal information systems; health information systems and others.
- Demonstrate an understanding of the importance of intellectual capital to benefit the competitive advantage in organizations.
- Develop a working knowledge in the area through focused projects. • Articulate various career options in the field.

Methods of teaching: lectures, projects, other methods

Pre- requirements: Basic knowledge in Foundation of informatics, mathematical logic, Data base.

**Exam:** Test and discussion at the end of the semester, individual tasks and the general student's work during the semester.

**Registration for the Course:** not necessary

**Registration for the Exam:** Coordinated with the lecturer and the Student Service Office

#### **References:**

1. Shelda Debowski, Knowledge Management, John Wiley & Sons Australia Ltd., Sidney, 2006.
2. Bergeron B., Essentials of Knowledge Management, John Wiley & Sons, Inc., Hoboken, New Jersey, 2003.
3. Ackerman M., Pipek V., and Wulf V., Sharing Expertise: Beyond Knowledge Management, Cambridge Ma: MIT Press, London, 2003.
4. Elias M. Awad & Hassan M. Ghaziri (2004), Knowledge Management, New Jersey: Pearson

Education, Inc.

5. Amrit Tiwana (2002), The Knowledge Management Toolkit, New Jersey: Pearson Education, Inc.

6. Bensoussan, B., C. S. Fleisher, The Financial Time Guide to Analysis for Managers, Pearson Education Ltd., 2009

7. Strategic Management, Theory and Application, Adrian Haberberg & Alison Rieple, Oxford University Press, New York, 2008

8. TRAINMOR KNOWMORE, Handbook on organizational knowledge management, 2008, Greece, <http://www.trainmor-knowmore.eu/>

9. Paul Bocij, Andrew Greasley, Simon Hickie, Business Information Systems, Technology Development & Management, Pearson Education Ltd, Harlow, 2008

### Graphic Design of Printed and Promotional Materials

**Semester:** 2 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 2 lectures hours and 1 lab hour per week / SS

**ECTS credits:** 4.5 credits

**Hours per week:** 1 lecture hour and 2 labs hours per week/FS

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslava Krалеva, PhD

**Course Status:** Optional Course in the Information Systems and Technologies in Master of Science Curriculum

**Course Description:** The course is a practical introduction to desktop publishing systems. Students learn the best practices in the development of print and electronic materials, such as brochures, leaflets, posters, magazines, newspapers and more. Studied are the principles of working with the software used in publishing. Discussed are typical problems in the field of publishing and advertising activities.

The course prepares students for the future development of different types of designs of promotional materials, web sites and more.

**Course Objectives** This course aims to provide students with knowledge and additional training in the theory and practice of publishing systems. They will learn about the methods of digital image processing, how to create vector graphics and prepress of promotional materials with different purpose.

**Teaching Methods:** Lectures, demonstrations, work on project and teamwork.

**Requirements:** Needed basic knowledge of operating systems, information technology, graphics editors and working with multimedia files.

**Assessment:** Evaluating the student shall be carried out in the sixth grad scale – 2, 3, 4, 5, 6. Evaluation of current control is obtained by taking the average of the assessment of coursework and paper. Students who have a minimum average estimate /3/ of the current control is not allowed to test the regular session. They must present additional development and evaluation after receiving at least medium /3/ be admitted to the written examination of supplementary or liquidation session. The final estimate is derived from the average of the current control and evaluation of the written exam.

**Registration for the Course:** Submitted an application to the academic department at the end of current semester.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department.

**References:**

1. Graphic Communications Open Textbook Collective (2015) “Graphic Design and Print Production Fundamentals”, Victoria, B.C.: BCcampus. Retrieved from <https://opentextbc.ca/graphicdesign/>
2. Clement, R. W. (1997) "Medieval and Renaissance book production", Library Faculty & Staff Publications. Paper 10. Retrieved from [https://digitalcommons.usu.edu/lib\\_pubs/10](https://digitalcommons.usu.edu/lib_pubs/10)
3. Halligan, B., & Shah, D. (2009). “Inbound Marketing.: Get Found Using Google, Social Media, and Blogs”. John Wiley & Sons.
4. Mathis, L. (2016). “Designed for use: Create usable interfaces for applications and the web”. Pragmatic Bookshelf.
5. Mandic, L., Grgic, S., & Srdic, I. (2002, June). Data formats in digital prepress technology. In International Symposium on VIPromCom Video/Image Processing and Multimedia

- Communications (pp. 437-440). IEEE. Retrieved from: [https://www.researchgate.net/publication/3963565\\_Data\\_formats\\_in\\_digital\\_prepress\\_technology](https://www.researchgate.net/publication/3963565_Data_formats_in_digital_prepress_technology)
6. Pettersson, R. (2019). "Image design. Drawings. Photographs", Institute for Infology. Sweden, Tullinge. Retrieved from: [https://www.researchgate.net/publication/281810640\\_4\\_Information\\_Design-Image\\_Design](https://www.researchgate.net/publication/281810640_4_Information_Design-Image_Design)
  7. Vlažo, K. (2019) "Designing a Socialist Man." AM Journal of Art and Media Studies, vol. 19, pp. 15-27. Retrieved from: <https://fmkjournals.fmk.edu.rs/index.php/AM/article/view/314/pdf>
  8. Макуейд, Дж. (2007) Професионален дизайн на печатни материали, СофтПрес.
  9. Паркър, Р. (2006) Професионален дизайн в рекламата, СофтПрес.
  10. Katz, J. (2012). Designing information: Human factors and common sense in information design. John Wiley & Sons.
  11. DiMarco, J. (2010) Digital Design for Print and Web. An Introduction to Theory, Principles, and Techniques, Wiley Publishing.
  12. Alvarez, C. (2017). "Lean customer development: Building products your customers will buy." O'Reilly Media, Inc.
  13. McCawley, R. (2016) Go Design Now! Print Production; Available: <http://www.godesignnow.com/>
  14. Jurković, M., & Di Scala, R. (2011). Inkscape 0.48 Illustrator's Cookbook. Packt Publishing Ltd. Available: <http://thuvienso.bvu.edu.vn/bitstream/TVDHBRVT/19453/1/Inkscape-0.48-Illustrators-Cookbook.pdf>
  15. Whitt, P. (2016). Pro Photo Colorizing with GIMP. Apress.
  16. *SCRIBUS: Open Source Desktop Publishing*, <http://www.scribus.net/canvas/Scribus>, 2012
  17. *GIMP: GNU Image Manipulation Program*, <http://www.gimp.org/>, 2012
  18. *INSCAPE: Open Source Scalable Vector Graphics Editor*, <http://inkscape.org/>, 2012

**Abbreviation:**

SS: Spring Semester

**Human Machine Interface Design and Analysis**

**Semester:** 2 semester

**Type of Course:** Lectures and tutorials in computer lab.



**Hours per week:** 1 lecture hour, 1 seminar hour and 1 hour tutorials in computer lab/SS

**Credits Number:** 4,5 credits

**Department:** Informatics

**Lecturer:** Prof. Daniela Tuparova, PhD

**Course Status:** elective course in curriculum of major Information Systems and Technologies, Master degree.

**Course description:**

The course is directed to mastering of core principles and techniques for design, development and analysis of HCI. The problems as rules for graphical design of interface of software applications, psychological characteristics of users target groups, psychology of the colors etc., are discussed. Usability and accessibility of software applications are considered. The techniques for usability analysis are performed.

**Objectives:**

The student should obtain basic knowledge in area of design, development and analysis of HCI.

**Methods of teaching:** lectures, tutorials, discussions, project based method.

**Pre - requirements:** No

**Assessment and Evaluation**

Project- 50%

Final Test- 50%

**The course is successful completed with at least 51 % of all scores.**

**Registration for the Course:** The students apply in Department of Informatics

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

Core

1. Стафанов, К. Проектиране на човеко-машинен интерфейс, онлайн курс - <http://www-it.fmi.uni-sofia.bg/courses/HCI/index2.htm>
2. Тупарова Д., Ползваемост на дигитални образователни ресурси, Образование и познание, София 2019

### Additional

3. Shneiderman, B., & Plaisant, C. (2010). Designing the user interface: Strategies for effective human-computer interaction. Boston: Addison-Wesley  
Dix A., Finlay at all, Human-Computer Interaction, <http://www.hcibook.com/e3/chaps/ch7/exercises/>
4. Interaction Design, <https://www.interaction-design.org/literature/topics/human-computer-interaction>
5. Helen Sharp, Jennifer Preece, Yvonne Rogers, Interaction Design: Beyond Human-Computer Interaction Wiley, 2019

### On-line resources

6. URL <http://dlearning.swu.bg>

## Pattern recognition

**Semester:** 2 semester

**Type of the course:** lectures and exercises

**Hours (per week):** 2 lecture hours and 1 lab hour per week/SS

**Credits:** 4,5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Stela Bancheva, PhD

**Status of the course in the educational plan:** Optional course in the Information Systems and Technologies M.S. Curriculum

### **Description of the course:**

This course covers subjects required as a background for IT professionals. This course expands techniques based on AI as well as new information technologies. The course covers main principles of the Pattern Recognition theory. Some of the topics included are data representation, discovering basic signs, determining optimal decisions procedures (using different approaches and parameter evaluation).

### **Course Aims:**

The course aim is to give students good basic theoretical knowledge and practical experience in pattern recognition. To become familiar with building mathematical models which they should use to solve different problems for classification simple objects.

**Teaching Methods:** lectures, discussions, practical work, laboratory exercises.

**Requirements/Prerequisites:**

Basic knowledge in Analytic Geometry, Linear Algebra, Analysis, Numerical Methods, Optimization. Advance knowledge in Discrete Mathematics, Graph Theory, Programming, Formal Languages and Grammars.

**Exam:** The assessment of the current control is formed by one course project. Students with a minimum grade average (3.00) of current control are admitted to the exam (written final test). The final score takes into account the results of the current control (75%) and the score from the written exam (25%).

**Registration for the course:** It is necessary to submit an application to a study department at the end of the previous academic year.

**Registration for exam:** Coordinated with the lecturer and Students Service Department.

### Computer security

**Semester:** 2 semester

**Course Type:** lectures and labs

**Hours (weekly):** 2 lecture hours and 1 lab hour per week / SS

**ECTS Credits:** 4.5 credits

**Department:** Informatics

**Lecturer:** Chief Assist. Prof. Ivo Damyanov, PhD

**Course Status:** Optional course from the Informatics Master Curriculum – 2 years.

**Course Description:**

This course is an introduction to computer security. Course topics cover risks of storing and sharing information and methods for its protection (hardware and software) from destruction and unauthorized access. The course makes a brief theoretical introduction to error correction codes and cryptographic systems. The main focus is on programming and technical means and methods of access control, computer security at different levels - personal, and corporate network, including security in social networks and cloud platforms.

**Course Objectives:** To provide the necessary basic knowledge about the computer security and to acquire knowledge and skills to identify possible risks in specific systems and apply different protection techniques. Acquisition of special training in computer systems and information protection.

**Teaching Methods:** Lectures, demonstrations, work on project and teamwork.

**Requirements/Prerequisites:** Needed basic knowledge of operating systems, programming, computer architectures, operating systems.

**Assessment:** written final exam

**Registration for the Course:** Students should submit an application to the Students Service at the end of the current semester.

**References:**

1. Олаф Кирх и Тери Доусън, 2001, Linux Network Administrator's Guide, SoftPress, разпространява свободно под GNU FDL.
2. Mark Rhodes-Ousley, Information Security (Second Edition), The complete reference, McGraw-Hill, 2013
3. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов, Защита на компютърната информация, УИ „Неофит Рилски“, 2005
4. Zlatogor Minchev, Cyber Threats in Social Networks and Users' Response Dynamics, ЦМСО, 2012, (<http://it4sec.org/article/cyber-threats-social-networks-and-users-response-dynamics>)
5. Zlatogor Minchev, Cyber Threats Analysis In On-Line Social Networks With A Study On User Response, ЦМСО, 2014, (<http://it4sec.org/article/cyber-threats-analysis-line-social-networks-study-user-response>)
6. Ronald L. Krutz, Russell Dean Vines, Cloud Security. A comprehensive guide to secure cloud computing, Wiley, 2010
7. Христо Тужаров, 2010, Архитектура на информационната сигурност, Асеновци
8. Ст.Станев, Ст.Железов, Хр. Параскевов, Хр.Христов, Ръководство за упражнения по стеганография, Университетско издателство „Епископ Константин Преславски“ Шумен, 2015
9. Цветан Семерджиев, Николай Митев. Норми и стандарти за управление на информационните системи. – София, изд. Софттрейд, 2014 г., ISBN 978-954-334-162-7
10. Himanshu Sharma, Kali Linux - An Ethical Hacker's Cookbook, Packt Publishing, 2017
11. Yuri Diogenes, Erdal Ozkaya, Cybersecurity - Attack and Defense Strategies, Packt Publishing, 2018
12. Веселина Спасова, СИГУРНОСТ ПО ДИЗАЙН В СОФТУЕРНОТО ИНЖЕНЕРСТВО, ВСУ „Черноризец Храбър“, Издателски център, 2022

**Internet technologies**

**Semester:** II semester

**Course Type:** lectures and tutorials in a computer lab.

**Hours (weekly):** 1 lecture hour and 2 lab hours per week / SS

**ECTS credits:** 4,5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Nadezhda Borisova, PhD

**Course Status:** An elective course in the major Information Systems and Technologies curriculum, Master degree.

**Course Description:** The course is an introduction to the design of Web-based Internet/Intranet information systems based on Oracle Application Express technology.

**Course Objectives** The student should obtain knowledge of:

- Design of Internet/Intranet Web-based information systems.
- Practical aspects of Internet/Intranet Web-based information systems development.

**Teaching Methods:** lectures, tutorials, discussions, project-based method.

**Requirements:** Database systems (core course), Web Design (core course)

**Assessment:**

- Project- 50%
- Final Test- 50%

The course is successfully completed with at least 51% of all scores.

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1. Oracle Corporation, Oracle Database® Database Concepts 19c, February 2020
2. Oracle APEX App Builder User's Guide, Release 23.1, F74108-02, Copyright © 2003, 2023, Oracle and/or its affiliates. Primary Author: Terri Jennings
3. Oracle APEX SQL Workshop Guide, Release 23.1, F74113-02, Copyright © 2008, 2023, Oracle and/or its affiliates. Primary Author: John Godfrey
4. Oracle APEX Administration Guide, Release 23.1, F74107-02, Copyright © 2003, 2023, Oracle and/or its affiliates. Primary Author: Terri Jennings
5. Rick Greenwald, Beginning Oracle® Application Express, ISBN 9780470388372.

## Programming with VBA

**Semester:** II semester

**Course Type:** lectures and tutorials in a computer lab.

**Hours (weekly):** 1 lecture hour and 2 lab hours per week / SS

**ECTS Credits:** 4,5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Nadezhda Borisova, PhD

**Course Status:** Optional course in the curriculum of major Information Systems and Technologies, Master degree.

**Course description:**

The course examines the possibility of programming in Microsoft Office based on the Visual Basic for Applications (VBA) language built into Office applications. Students will learn basic methods for creating VBA macros, allowing them to extend the possibilities of MS Word, MS Excel and MS PowerPoint applications and to solve specific tasks in the environment of the Office package. Tasks to create a user-friendly interface will also be covered.

**Objectives:**

The purpose of the course is for students to become familiar with the basic concepts of calculations in MS Excel, to acquire skills in creating macros and algorithmizing tasks in the product, and to be able to compile programs in the Visual Basic for Application (VBA) language.

**Teaching Methods:** lectures, tutorials, discussions, project-based method.

**Requirements:** Basic knowledge of Informational Technologies and Programming.

**Assessment:**

- Project- 50%
- Final Test- 50%

The course is successfully completed with at least 51% of all scores.

**Registration for the Course:** by request at the end of the current semester

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1. Sequeira, J. (2020), Programming EXCEL with VBA.
2. Blanco, G. (2020). Recode In VBA: Learn to Automate Excel by Programming a Fully Functional Model. United States: Holler Data LLC.
3. Sanchez, E. N. (2022). Programming PowerPoint With VBA Straight to the Point. United States: Holy Macro! Books.
4. VBA Notes for Professionals book. (2023). Concepts Books Publication.

## Web Mining

**Semester:** 2 semester

**Type of Course:** Lectures and tutorials in computer lab

**Hours per week:** 1 lecture hour and 2 hours tutorials in computer lab

**Credits Numbers:** 4,5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Elective.

**Course description:** This course introduces students to the automated collection of data from websites and social media. Students get to know basic concepts of web mining for different science areas research and learn to use tools that enable them to compile their own data sets from web sources.

The main goal of the course is to enable students to conduct automated data collection from web sources on their own. Students get familiar with the advantages and disadvantages of extracting information from the Internet for scientific research. Finally, students get an opportunity to think about science research questions with respect to human behavior that is particularly observable on the web (i.e., in social media, blogs, etc.).

**Objectives:**

Students will know the basic concepts of contemporary web technologies relevant for web data mining.

- Students will know how to apply the relevant R packages to effectively and efficiently collect data from different types of web sources.
- Students understand the basic ethic and legal aspects of web data collection for research purposes.
- Students understand different theoretical procedures of web data collection such as snowball sampling and how to implement/apply them in a simple context.

**Methods of teaching:** lectures, tutorials, discussions, project based method.

**Pre- requirements:** C++ programming

### **Assessment and Evaluation**

Tutorial - 70%

Final Test - 30%

**The course is successful completed with at least 51% of all scores.**

**Registration for the Course:** required (elective course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

### **References**

1. Liu, Bing (2011). Web Data Mining. New York, NY: Springer.
2. Mitchell, Ryan (2015). Web Scraping with Python. Sebastopol, CA: O'Reilly.
3. Munzert, S. and Rubba, C. and Meißner, P. and Nyhuis, D. (2014). Automated Data Collection with R: A Practical Guide to Web Scraping and Text Mining. Chichester, UK: Wiley.
4. Russell, Mathew A. (2014). Mining the Social Web. Sebastopol, CA: O'Reilly.

## **Data Mining**

**Semester:** 3 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 2 lecture hours and 2 labs hours per week/FS

**ECTS credits:** 6.0 credits

**Department:** Informatics



**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Compulsory Course in Master of Science Curriculum of Information Systems and Technologies

**Course Description:**

The course consists of several modules, such as business analysis, knowledge extraction and dependency extraction from various sources. In the classroom, students learn to define meaningful business questions, choose an appropriate method of data analysis and apply it, use open source software for business analysis, interpret the result and publish the result in a scientific publication. The study of the module related to knowledge extraction aims to learn the methods for extracting implicit and potentially useful connections from structured information sources. New skills for work in the field of artificial intelligence are formed, as well as with statistical and mathematical methods. Students' knowledge of analysis and derivation of dependencies is expanding as the applied sources are mostly unstructured and located in the global network.

The course uses a real set of data and free software to extract knowledge.

The aim of the course is to train students in new skills for analysis of different data sets and for detecting dependencies that are not visible with traditional means of reporting. Modern methods of solving business issues are applied.

The main task is for the student to acquire knowledge of the techniques for extracting knowledge and data relations.

The expected results are the mastering by the students of the modern techniques for extracting knowledge and data relations.

**Registration for the Course:** The course is compulsory and is not applied for its study.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

**References:**

1. Berkhin P, Survey of Clustering Data Mining Techniques.
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Second Edition, 2006.
3. Jiawei Han, Jian Pei and Micheline Kamber, Data Mining: Concepts and Techniques, Third Edition, 2012.
4. Daniel T. Larose, Discovering knowledge in data. An Introduction to Data Mining, John Wiley & Sons, Inc., Hoboken, New Jersey, 2005.
5. Murthy S., Automatic Construction of Decision Trees from Data: A Multi-Disciplinary Survey.

Journal of Data Mining and Knowledge Discovery, vol. 2, num. 4, 1998.

6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach. Prentice Hall, Second Edition, 2003.

7. Ruth Dilly, Data Mining - An Introduction. The Queen's University of Belfast - OHP Slide Material, Student Notes.

## Component-Oriented Software Engineering

**Semester:** 3 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 2 lecture hours and 2 labs hours per week/FS

**ECTS credits:** 6.0 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Velin Kralev, PhD, e-mail: velin\_kralev@swu.bg

**Course Status:** Compulsory Course in Master of Science Curriculum of Information Systems and Technologies

### Course Description:

The basic principles for creating and using components in the development of software solutions are presented in the course. The topics to be discussed are as follows: programming fundamentals. Understanding the component library; introduction to component creation<sup>2</sup>. Introduction to component creation; object-oriented programming for component writers; creating properties; creating events; creating methods; using graphics in components; handling messages; making components available at design time; modifying an existing component; creating a graphic component; customizing a grid; making a control data aware; making a dialog box a component; extending the IDE;

### Course Objectives:

The aim of the course is to teach students some of the basics in creating component-oriented software solutions, using visual design environments and event-oriented programming.

After completion of the course students should be able to:

- create and use different types of components in the development of software products

**Teaching Methods:** Lectures, demonstrations, work on project.

**Requirements/Prerequisites:** Needed basic knowledge of object-oriented programming. Desirable knowledge of visual design environments and event-oriented programming, such as RAD Studio or/and Visual Studio.

**Assessment:** Evaluating the student shall be carried out in the sixth grad scale. Current control is performed during the laboratory sessions during the semester through two courseworks, one control test and one course project (50% of final grade). Course ends with a written exam on the material according to the attached syllabus (50% of final grade). When shown a weak exam score, the student appears on the makeup exam and retain the information received from the course work assessment.

**Registration for the Course:** The course is compulsory and is not applied for its study.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

**References:**

1. Embarcadero Technologies. (2021). Component Writer's Guide: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site: [docwiki.embarcadero .com/RADStudio/Seattle/en/Component\\_Writers\\_Guide\\_Index](https://docwiki.embarcadero.com/RADStudio/Seattle/en/Component_Writers_Guide_Index).
2. John Barrow, Linda Miller, Katherine Malan, Helene Gelderblom. (2005). Introducing Delphi Programming: Theory through Practice 4th Edition. Publisher: Oxford University Press.
3. Danny Thorpe. (1996). Delphi Component Design Paperback. Publisher: Addison-Wesley.
4. Marco Cantu. (2003). Mastering Delphi 7. Publisher Sybex.
5. Marco Cantu. (2010). Delphi 2010 Handbook: A Guide to the New Features of Delphi.
6. Nick Hodges. (2015). More Coding in Delphi. Publisher: Nepeta Enterprises.

**Abbreviation:**

FS: Fall Semester

## Semantic Web

**Semester:** 3 semester

**Course Type:** Lectures and tutorials in a computer lab.

**Hours per week:** 2 lecture hours and 2 labs hours per week/FS

**ECTS credits:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Nadezhda Borisova, PhD

**Course Status:** Compulsory Course in the curriculum of major Information Systems and Technologies, Master degree.

**Course Description:** The Semantic Web is a vision of an extension of the existing World Wide Web, which provides software programs with machine-interpretable metadata of the published information and data. The course discusses the basic concepts and layered architecture of the semantic web.

### **Course Objectives**

The student should obtain knowledge of:

- How Semantic Web technology fits into the past, present, and future evolution of the Internet.
- How Semantic Web technology differs from existing data-sharing technologies, such as relational databases and the current state of the World Wide Web.
- The international standards that help define the Semantic Web.

**Teaching Methods:** lectures, tutorials, discussions, project-based method

**Requirements:** Basic knowledge of Informational Technologies, Operating Systems, Databases and Programming.

### **Assessment:**

- Project- 50%
- Final Test- 50%

The course is successfully completed with at least 50% of all scores.

**Registration for the Course:** not required (core course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

### **References:**

1. Semantic Web: Extending the World Wide Web to make internet data machine-readable to offer significant advantages such as reasoning over data and operating with heterogeneous data sources. (2022). One Billion Knowledgeable.
2. Hendler, J., Gandon, F., Allemang, D. (2020). Semantic Web for the Working Ontologist: Effective Modeling for Linked Data, RDFS, and OWL. United Kingdom: Association for Computing Machinery and Morgan & Claypool Publishers.

3. DeWeese, K. P., Segal, D. (2022). Libraries and the Semantic Web. Switzerland: Springer International Publishing.
4. Hogan, A. (2020). The Web of Data. Germany: Springer International Publishing.
5. Kornai, A. (2020). Semantics. Switzerland: Springer.

### **JSP and Java servlet programming (Web programming)**

**Semester:** 3 semester

**Course Type:** lectures and exercises

**Hours per week:** 2 lecture hours and 2 lab hours per week/FS

**ECTS credits:** 6

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Optional course

**Course Description:**

The course is designed for students who are interested in Java programming and development of Internet-oriented applications and aims to introduce students to the following technologies:

- Socket programming - development of Java applications that communicate over the Internet / Intranet via TCP / IP protocols, such as Chat client / servers, Web servers, Mail client / servers, etc.
- Java applets - development of small Java applications that can be embedded in Web pages and run from the client's Web browser.
- Web applications - development of Web applications with Servlets and Java Server Pages (JSP) technologies, creation and deployment of Web applications according to Sun standards for J2EE, work with Tomcat server. In order to understand the material, it is necessary for students to have basic knowledge of Internet organization, programming, Java and HTML. Due to its large volume, the topic will be divided into several modules.

**Objectives:** The course aims to provide new knowledge related to web programming. The main task is for the student to acquire knowledge of web programming.

**References:**

1. Светлин Наков, Борис Червенков, Интернет програмиране с Java, <http://www.nakov.com>
2. The Java EE 5 Tutorial - <http://java.sun.com/javase/5/docs/tutorial/doc/JavaEETutorial.pdf>
3. Java API документация - <http://java.sun.com/javase/6/docs/api/>

4. Eclipse - [www.eclipse.org](http://www.eclipse.org)
5. Apache Tomcat - <http://tomcat.apache.org/>
6. Step-by-step tutorial: <http://www.java-tips.org/java-tutorials/tutorials/introduction-to-java-servlet>.

### Stochastic simulation

**Semester:** 3 semester

**Course Type:** lectures and exercises

**Hours per week:** 2 lecture hours and 2 lab hours / FS

**ECTS credits:** 6

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslav Mavrevski, PhD

**Status of course in the curriculum:** elective course

**Course Description:**

The Stochastic Simulation course aims to familiarize students with the possibilities of conducting computer experiments with mathematical models of complex real-world systems. Includes basic methods and tools for implementing computer simulations.

**Teaching Methods:** lectures, demonstrations and work on project

**Assessment:** course project and exam

**Registration for the Exam:** coordinated with the lecturer and Student Service Department

**Registration for the Course:** by application in the Educational Office in the end of the semester

**References:**

*1) Основна*

1. Калинов К., Статистически методи в поведенческите и социалните науки, НБУ, 2016
2. Johnson, Richard A.; Wichern, Dean W. (2007). Applied Multivariate Statistical Analysis (Sixth ed.). Prentice Hall. ISBN 0-13-187715-1, ISBN 978-0-13-187715-3.
3. Richard G. Bereton, Data analysis for the laboratory and Chemical Plant, University of Bristol, UK, 2009
4. The Statistics Homepage - <http://www.statsoft.com/textbook/stathome.html> ©1984-2018
5. COMPUTATIONAL CHEMISTRY, A Practical Guide for Applying Techniques to Real-World Problems David C. Young, 2001, Copyright by John Wiley & Sons, Inc.

6. Wolfgang Karl Härdle, Léopold Simar, Applied Multivariate Statistical Analysis, Springer, 2019.

2) Допълнителна

1. Каращранова Е. Интерактивно обучение по вероятности и статистика, ЮЗУ, 2010 г.

**Abbreviation:**

FS: Fall Semester

### Applied Statistics

**Semester:** 3 semester

**Type of Course:** lectures and tutorials in computer lab

**Hours per week:** 2 lecture hours and 2 hours tutorials in computer lab/FS

**Credits Number:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. E. Karashtranova, PhD

**Course Status:** Elective course in curriculum of major IST. Master degree.

**Course description:**

The course is introduction in nonparametric statistic and possibilities to apply IT in this area.

**Objectives:** The students should obtain knowledge of:

- To apply the methods of nonparametric statistics in practice;
- To realize concrete applications with tools of IT.

**Methods of teaching:** seminars, tutorials, discussions, project based method.

**Pre- requirements:** Probability and Statistics, Information Technology

**Assessment and Evaluation**

Project- 70%

Final Test- 30%

**The course is successful completed with at least 50% of all scores.**

**Registration for the Course:** required

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

## Cloud technologies

**Semester:** 3 semester

**Type of Course:** lectures and exercises

**Hours per week:** 2 lecture hours and 2 hours exercises/FS

**Credits Numbers:** 6 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Elective course in curriculum of major Information Systems and Technologies, Master degree.

**Course description:**

The course is introduction in main aspects of knowledge bases and application.

**Objectives:**

The student should obtain knowledge of:

- Cloud computing.
- Application of knowledge bases.

**Methods of teaching:** lectures, discussions, project based method.

**Pre- requirements:** Logical programming, Artificial Intelligence, and Mathematical Logics (core courses)

**Assessment and Evaluation**

Project- 50%

Final exam- 50%

**Registration for the Course:** by request at the end of the current semester

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1. Blain Barton – “Microsoft Public Cloud Services: Setting up Your Business in the Cloud”, Microsoft Press, 2015.



2. . Thomas Erl, Ricardo Puttini, Zaigham Mahmood – “Cloud Computing: Concepts, Technology & Architecture”, Prentice Hall, Upper Saddle River, NJ, Fourth Printing, 2014.
3. Michael J. Kavis – “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)”, Wiley, 2014.
4. Michał Tomasz Jakóbczyk- “Practical Oracle Cloud Infrastructure” ,Oracle, 2020
5. Стоян Велев, Христо Добчев. SAP Labs Bulgaria 2013

### Applications of databases in bioinformatics

**Semester:** 3 semester

**Course Type:** lectures and exercises

**Hours per week:** 2 lecture hours and 2 exercise hours per week / FS

**ECTS credits:** 6

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslav Mavrevski, PhD

**Status of course in the curriculum:** elective course

**Course Description:**

The main types of biological data bases and bioinformatics tools will be presented in the course. Various highly effective data sources in bioinformatics will be explained in detail. Examples will illustrate the application databases in different areas of bioinformatics. The course will use modern software tools for working with biological databases.

**Teaching Methods:** lecture, discussion, exercises

**Assessment:** current control and exam

**Registration for the Course:** by application in the Educational Office in the end of the semester

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1) Basic

1. Kevin Byron, Katherine G. Herbert, Jason T. L. Wang. (2017). Bioinformatics Database Systems, Taylor & Francis Group, LLC.
2. Martin J. Bishop. (1999). Genetics Databases, Academic Press A Harcourt Science and Technology Company 24-28 Oval Road, London.

## 2) Additional

3. Веселин Баев, Елена Апостолова, Евелина Даскалова, Георги Минков. (2013). Ръководство по Биоинформатика, Първо електронно издание, Пловдивски Университет "Паисий Хилендарски", ISBN:978-954-423-835-3.

### **Abbreviation:**

FS: Fall Semester

## **Theory, Algorithms and Technologies for Speech Recognition**

**Semester:** 3 semester

**Course Type:** lectures and tutorials

**Hours per week:** 2 lecture hours and 2 lab hours per week / FS

**ECTS credits:** 6.0 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslava Kraveva, PhD

**Course Status:** Optional Course in Master of Science Curriculum of Information Systems and Technologies

**Course Description:** In this course, the theoretical foundations of modern speech processing technologies will be discussed. Some speech recognition software and using them to Bulgarian speech recognition will be viewed.

**Course Objectives:** This course aims to provide the students with the knowledge and practical experiences for the modern technology of natural speech processing.

After the course completed, the students should know and understand:

- The methods of speech signal processing and retrieve their features.
- The methodology of the construction of a phonetic and language model in a given language.

**Teaching Methods:** Browsing the Web, work on coursework and essay.

**Requirements/Prerequisites:** The knowledge by the courses "Programming and Data Structures", "Object-Oriented Programming", "Database", "Discrete Mathematics", "Linguistics", "Pattern Recognition" and "Neural Networks", are necessary.

**Assessment:** Evaluating the student will be carried out by the six-point marking scale. The final assessment is in the form of a test that covers the whole teaching material including theoretical questions and practical cases. The final mark presents 50% of the final test and 50% of the mark of the course work.

**Registration for the Course:** Applied to the academic department at the end of current semester.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

**References:**

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, Spoken Language processing – A Guide to Theory, Algorithm, and System Development, Prentice Hall PTR, 2001
2. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon (2001) Spoken Language processing – A Guide to Theory, Algorithm, and System Development, Prentice Hall PTR
3. Stephen E. Levinson (2005) Mathematical Models for Speech Technology, John Wiley & Sons
4. Wu Chou, Bing Hwang Juang (2003) Pattern Recognition in Speech and Language Processing, CRC Press
5. Joseph Keshet, Samy Bengio (2009) Automatic Speech and Speaker Recognition – Large Margin and Kernel Method, John Wiley & Sons
6. Lawrence Rabiner, Ronald Schafer (2010) Theory and Application of Digital Speech Processing, Prentice Hall
7. Daniel Jarefsky, James Martin (2008) Speech and Language Processing (2nd Edition), Prentice Hall
8. Dong Yu, Li Deng (2014) Automatic Speech Recognition: A Deep Learning Approach, Springer
9. James R. Lewis (2011) Practical Speech User Interface Design, CRC Press
10. Homayoon Beigi (2011) Fundamentals of Speaker Recognition, Springer
11. Willi-Hans Steeb (2005) Mathematical Tools in Signal Processing with C++ and Java Simulations, University of Johannesburg, South Africa
12. K. R. Rao, D. N. Kim, J. J. Hwang (2010) Fast Fourier Transform: Algorithms and Applications, Springer
13. Р. Кралева (2019) Разпознаване на реч: Корпус от говорима детска реч на български език, ISBN: 978-954-00-0199-9, УП „Неофит Рилски“, Благоевград.
14. Data Exchange System, <http://chilides.psy.cmu.edu/>
15. Praat: doing phonetics by computer, <http://www.fon.hum.uva.nl/praat/>
16. WaveSurfer, <http://www.speech.kth.se/wavesurfer/>
17. The International Phonetic Association, <http://www.langsci.ucl.ac.uk/ipa/index.html>

## Business Process Management Systems

**Semester:** 4 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 2 lecture hours and 2 lab hours per week/SS

**ECTS credits:** 6.0 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Compulsory Course in the Information Systems and Technologies in Master of Science Curriculum

**Course Description:**

The course gives a general idea of business process management as a scientific discipline and its relationship with the strategic management of organizations. Basic concepts of the discipline, basic processes and models for process management, methods of business process management, design and control of a business process management system are considered.

Special attention in the course is paid to quantitative and qualitative analysis of the processes.

The course examines practical methods for managing processes in terms of human resources and information technology that supports them. The practical classes are related to the real practice in business process management.

For the course it is necessary for the students to have knowledge of information technologies and experience with their use.

The main goal of the course is to acquaint students with the theory of business process management and its application in organizations and companies. The course provides new knowledge about processes and business process management models.

The main task is for the student to acquire knowledge about the nature of business processes, business process design and business process management models, process management methods and process analysis.

The expected results are the mastery by the students of the modern general formulations for a business process management system and business process management practice.

**References:**

1. Mathias Weske, Business Process Management Concepts, Languages, Architectures, Second Edition, Springer-Verlag Berlin Heidelberg 2007, 2012.

2. Marlon Dumas, Marcello La Rosa, Jan Mendling, Hajo A. Reijers, Fundamentals of Business Process Management, Springer-Verlag Berlin Heidelberg 2013.
3. Business Process Management For Dummies®, 4th IBM Limited Edition, John Wiley & Sons, Inc, 2017.
4. <http://fbm.uni-ruse.bg/d/bsa/bsa-L1.pdf>.
5. <http://tuj.asenevtsi.com/BIS09/BIS30.htm> , Христо Тужаров , Бизнес процеси
6. <http://www.uni-svishtov.bg/dialog/2013/INI/05-statia-2013.pdf> - Кремена Маринова
7. [http://www.antipodes.bg/bg/cubes/what\\_is\\_bpm/](http://www.antipodes.bg/bg/cubes/what_is_bpm/) - , BPM

### Application software for automatic translation

**Semester:** 4 semester

**Course Type:** lectures and tutorials

**Hours per week:** 2 lecture hours and 1 lab hour per week/SS

**ECTS credits:** 4.5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Irena Atanasova, PhD

**Course Status:** Optional Course in Master of Science Curriculum of Information Systems and Technologies

**Course Description:** The course of the course Applied Software for Automatic Translation, included as an elective in the curriculum of the specialty Information Systems and Technologies aims to build students the necessary skills for their future development as technical assistants, programmers, assistants supporting the software and more. and increasing their competitiveness in the labor market. The course on the subject Applied Software for Automatic Translation contains a short theoretical introduction, with an emphasis on the ideology and application of computer-assisted translation tools. The emphasis is on practical work, each student performs and stores the tasks assigned by the teacher on a separate computer equipped with the necessary software.

**Objectives:** The course aims to provide students with basic theoretical knowledge of the basic components that make up such software and practical skills for applying modern tools for computer-assisted translation (Computer Assisted Translation Tools (CAT) Tools). The possibilities for creating and working with terminological dictionaries and databases of multilingual translation memories (TM) are considered. The training is focused on mastering the specialized translation

software SDL Trados Studio, which is an indispensable assistant to the modern translator, and in addition its use is mandatory for all translations for the needs of the European Union bodies.

**Expected results:** Students who have completed their training in the discipline should acquire: basic knowledge of the architecture of modern automatic translation programs, knowledge of fuzzy logics, fuzzy databases and translation reliability factor, practical skills in the application of automatic software translation.

**Prerequisites:** Students must be fluent in at least one foreign language (B2 / C1) and have a basic knowledge of information technology and programming.

**Registration for the Course:** Applied to the academic department at the end of current semester.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

**References:**

1. Fuzzy sets and fuzzy logic: theory and applications. Prentice Hall, 1995. ISBN 978013101 1717.
2. Hans—Jilrgen Zimmermann. Fuzzy set theory—and its applications. 4th. Kluwer, 2001. ISBN 9780792374350.
3. Fundamentalsof fuzzy sets. T. 7. Springer, 2000. ISBN 9780792377320.
4. Beynon—Davies, Paul (2003). Database Systems (3rd ed.). Palgrave Macmillan. ISBN 978—1403916013
5. Kockaert, Hendrik; Steurs, Frieda (2015). Handbook of Terminology. 1. Amsterdam: John ‘|
6. Benjamins Publishing Company. p. 225
7. DePalma, Donald A. (July 2005). "SDL-TRADOS: Language Service Provider Reaction to ‘ SDIz's‘Purchase of TRADOS"
8. Ullman, Jeffrey; Widom, Jennifer (1997). A First Course in Database Systems. Prentice—Hall. ISBN 0138613370

### Training at IT Company (Institution)

**Semester:** 4 semester

**Course Type:** seminars and tutorials

**Hours per week:** 1 seminar hour and 2 lab hours per week/SS

**ECTS Credits:** 4,5 credits

**Department:** Informatics

**Instructor:** Part-time Assist. Prof. Ivan Zhdrapanski

**Course Status:** An elective course in the curriculum of major Information Systems and Technologies, Bachelor degree.

**Course description:**

The course is designed for acquiring practical skills and habits and the acquisition of expertise through introduction and participation in the activities of companies and organizations, that design, implement, deploy and use modern IT.

**Objectives:**

This course aims to bind the knowledge gained from university education with hands-on activities performed in different IT companies (organizations).

**Methods of teaching:** Work in a real work environment.

**Pre-requirements:** Basic knowledge of Informational Technologies, Operating Systems, Databases and Programming.

**Assessment:** report; journal of the conducted practical training;

**Registration for the Course:** not required (core course)

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

## Natural language processing systems

**Semester:** 4 semester

**Course Type:** lectures and tutorials

**Hours per week:** 2 lecture hours and 1 lab hour per week/SS

**ECTS credits:** 4,5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Nadezhda Borisova, PhD

**Course Status:** Elective course in the curriculum of major Information Systems and Technologies, Master degree.

**Course Description:** Natural Language Processing, usually shortened as NLP, is a subfield of artificial intelligence that deals with the interaction between computers and humans using the

natural language. NLP systems capture meaning from an input of words (sentences, paragraphs, pages, etc.) in the form of a structured output

**Course Objectives:** The purpose of the course is to introduce students to the basic principles, algorithms and techniques that underpin modern natural language automatic processing (NLP) technologies.

**Teaching Methods:** lectures, tutorials, discussions, project-based method

**Requirements:** Basic knowledge of Databases and programming.

**Assessment:**

- Project- 50%
- Final Test- 50%

The course is successfully completed with at least 50% of all scores.

**Registration for the Course:** by request at the end of the current semester

**Registration for the Exam:** coordinated with the lecturer and the Student Service Office

**References:**

1. Maynard, D., Bontcheva, K., Augenstein, I. (2022). Natural Language Processing for the Semantic Web. Switzerland: Springer International Publishing.
2. Vajjala, S., Majumder, B., Gupta, A., Surana, H. (2020). Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems. United States: O'Reilly Media.
3. Handbook of Natural Language Processing. (2023). (n.p.): Certybox.
4. McRoy, S. (2021). Principles of Natural Language Processing. United States: Susan McRoy.
5. Speech and Language Processing: Computational Linguistics and Natural Language Processing. (2022). United States: States Academic Press.



## Information systems in bioinformatics

**Semester:** 4 semester

**Type of Course:** lectures and tutorials in computer lab

**Hours per week:** 2 lecture hours and 1 hour tutorials in computer lab/ SS

**Credits Numbers:** 4.5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Radoslav Mavrevski, PhD

**Course Status:** Elective course in the curriculum of the “Information Systems and Technologies”, Master degree, 2 years of study.

**Course description:** The course "Information Systems in Bioinformatics" is an elective course for students of the specialty Information Systems and Technologies (1st year students, 2nd semester) in the fields of programming, algorithms and bioinformatics in the fields of programming, algorithms and bioinformatics. Topics data representation in computer, algorithms, data types, syntax and semantics of programming languages, tools for developing and testing information systems in bioinformatics.

**Objectives:** The students should obtain basic knowledge and skills in programming of information systems in bioinformatics.

**Methods of teaching:** lectures, tutorials, discussions, project based method.

**Requirements/Prerequisites:** Students in this course need to have basic knowledge of algebra, probability theory, analysis, etc.

**Assessment:** written final exam

**Registration for the Course:** the course is compulsory

### References

1. Увод в BioJava. [http://biojava.org/wiki/Main\\_Page](http://biojava.org/wiki/Main_Page)
2. Прееслав Наков. Въведение в програмирането с Java. 2012, <http://www.introprogramming.info/intro-java-book/read-online/>
3. Talarida J. Jacobs. Jacobs L. The dose –response relationship in pharmacology. Springer – Verlag. New York 1979

4. Jose Maria Lagaron, Antimicrobial Polymers, 0470598220, Publisher : Wiley, 2013
5. Approved drug products with therapeutic equivalence evaluations, u.s. department of health and human services, 2013
6. Knuth D.E. Postscript about NP-hard Problems, SIGACT News, 1974.
7. Reingold E.M., Neivergelt J., Deo N. Combinatorial algorithms (Theory and Practice), 1980.

### Information Systems with Client-Server Architecture

**Semester:** 4 semester

**Course Type:** lectures and lab exercises

**Hours per week:** 2 lecture hours and 1 labs hour per week/SS

**ECTS credits:** 4.5 credits

**Department:** Informatics

**Lecturer:** Assoc. Prof. Velin Kralev, PhD, e-mail: velin\_kralev@swu.bg

**Course Status:** Optional Course in Master of Science Curriculum of Information Systems and Technologies

**Course Description:**

The course teaches methods for developing client-server and multi-layer databases applications through object-oriented integrated development environments (IDEs) for visual design and event-oriented programming. Various aspects of design databases applications using various objects: a datasets, tfield objects and data bound controls. Developed different applications to access data depending on their architecture: client-server and multi-layer (client-application server-server). Students learn different technologies for data access by: ADO, dbExpress, IBExpress, DataSnap, Cloud applications and others.

**Course Objectives:**

The course objective is to give students an idea of some of the main technologies used for developing client-server and multi-layer applications for databases and their methods of use.

After completion of the course students should be able to:

- use different technologies when developing client-server and multi-layer applications for databases with different architecture.

**Teaching Methods:** Lectures, demonstrations, work on project.

**Requirements/Prerequisites:** Needed basic knowledge of databases and object-oriented programming. Desirable knowledge of programming languages C + +, Object Pascal (Delphi) and C #.

**Assessment:** Evaluating the student shall be carried out in the sixth grad scale. Current control is performed during the laboratory sessions during the semester through two courseworks, one control test and one course project (50% of final grade). Course ends with a written exam on the material according to the attached syllabus (50% of final grade). When shown a weak exam score, the student appears on the makeup exam and retain the information received from the course work assessment.

**Registration for the Course:** Submitted an application to the academic department at the end of current semester.

**Registration for the Exam:** Coordinated with the lecturer and Student Service Department

**References:**

1. Embarcadero Technologies. Developing Database Applications: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site. 2021.
2. Marco Cantu. Mastering Delphi 7. Publisher Sybex. 2003.
3. Marco Cantu. Delphi 2010 Handbook: A Guide to the New Features of Delphi 2010. 2010.
4. Mario Szpuszta, Ingo Rammer. Advanced .NET Remoting. Publisher: Apress; 2nd ed. 2005.
5. Bob Swart. Delphi XE DataSnap Development Essentials. Bob Swart Training & Consultancy. 2011.
6. Cary Jensen Ph,D. Delphi in Depth: ClientDataSets, Publisher CreateSpace Independent Publishing Platform. 2011.
7. Andrew Troelsen. Pro C# 5.0 and the .Net 4.5 Framework, Apress. 2012.
8. Tim Patrick. Microsoft ADO.NET 4 Step by Step. Publisher: Microsoft Press. 2010.
9. Xavier Pacheco. Delphi for .NET Developer's Guide. Publisher: Sams Publishing. 2004.

**Abbreviation:**

SS: Spring Semester