QUALIFICATION CHARACTERIZATION
of major field of study "Information Systems and Technologies" for "Bachelor of Science" degree with professional qualification "EXPERT OF INFORMATION AND COMMUNICATION TECHNOLOGIES"

The field of study "Information systems and technologies" is from an area of higher education 4. Natural sciences, mathematics and computer science, in professional branch 4.6. Informatics and computer science. Studying in the specialty of educational qualification degree "Bachelor of science" has a full-time course lasting 4 years (8 semesters). Information Systems and Technologies obtain good theoretical training and practical and applied knowledge and they form professional qualities that give them the opportunity to successfully realize as experts of information and communication technologies (ICT), developers of software and software applications, system and network administrators, database designers, graphic designers, software experts, applied programmers, web and multimedia developers, etc., as well as to continue their education in Master programs.

During the education, compulsory, optional and elective courses are studied in the area of Informatics and Applied Mathematics, foreign language and sport. Courses are classified in groups and areas as follows: 33 compulsory courses, 10 optional courses selected from 7 groups of courses, foreign language in 2 parts, sport in four semesters. The total number of hours for the 4-year course of study is within 2265 class hours at the University. Extracurricular occupation includes students' independent work, attending library and computer laboratories, tutorials, etc. Faculty of Mathematics and Natural Sciences is responsible for the education, as well as Philological Faculty and Faculty of Public Health and Sport that are responsible for education in the area of foreign language and sport, respectively.

REQUIREMENTS TO PREPARATION OF STUDENTS COMPLETING THIS MAJOR FIELD OF STUDY

The goal of the new specialty is to prepare quality professionals in the field of Information system and technologies, needed both for business and for science and society.

The specialty Information systems and technology has a theoretical-practical focus. The curriculum includes compulsory courses, providing basic general training in the field of information systems and information technology. With the optional courses, the students have the opportunity to choose and enrich their knowledge and practical skills for specific areas of computer science, information technology, and information systems. The elective courses

provide students the opportunity to study specialized courses from mathematics, economics, business, language learning and more.

The students receive thorough knowledge in the field of information processes and models, technologies related to computer science, the use of different software products, design, development, and implementation of software products for various fields of application.

The students completed BSc degree in Information systems and technologies have to possess following knowledge, skills, and competencies:

- to adapt and introduce program products and systems;
- to take part in the development of program products and packages;
- to use mathematical models and software packages for solving real economic, engineering and management problems in continuous and discrete macrosystems;
- to solve various optimization problems;
- to use computer systems for automating the production process and management.

PROFESIONNAL COMPETENCES OF STUDENTS

South-West University "Neofit Rilski" prepares qualified experts in Informatics that can apply their knowledge and skills in the area of science, culture, education and economics in Bulgaria and abroad.

In the process of learning, the students acquire complementary skills such as searching for information in many different sources (book, scientific journal, internet etc.) for specific subject areas; to prepare for the multimedia presentation and protection of various exchange projects and tasks, reports, and research reports; a sufficiently high level of proficiency in English in the field of information systems and technologies.

At completion of Bachelor of Science degree in Information systems and technologies, students obtain:

- good preparation in the area of informatics and information systems and technologies as well as solid practical skills conforming to modern European standards and requirements
- ability to apply in practice a wide range of technological tools and methods for solving the problem and non-standard tasks;
- thinking style and affinity to the quickly changing requirements of the information society;
- good opportunities for realizing as experts in Bulgaria or abroad;
- opportunity for successful continuation of education in higher degrees (Master of Science and Ph.D.) in Bulgaria and abroad.
- qualities of teamwork, responsibility, and self-learning.

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- qualities of teamwork, responsibility, and self-learning.

THE AREA OF PROFESSIONAL DEVELOPMENT

Bachelor students of Information Systems and Technologies obtain good theoretical training and practical and applied knowledge and they form professional qualities that give them the opportunity to successfully realize as experts of information and communication technologies (ICT), developers of software and software applications, system and network administrators, database designers, graphic designers, software experts, applied programmers, web and multimedia developers, etc., as well as to continue their education in Master programs.

The qualification characterization of the major field of study "Information system and technologies" for BSc degree, with professional qualification "The expert of information and communication technologies", is a basic document that determines rules for developing the curriculum. This qualification characterization is confirmed with legislation in the area of higher education in the Republic of Bulgaria. It is consistent with the law on higher education in Bulgaria, the State requirements for the acquisition of higher education in "Bachelor of Science" and "Master of Science" degree, the European and the national qualifications framework and regulations of the South-West University.

The qualifying characteristic is accepted at a session of:

- The Informatics Department Council held on April 16, 2015, Protocol No 6;
- The Faculty Council of the Faculty of Natural Sciences and mathematics held on April 15, 2015, Protocol No 8;
- The Academic Council of South-West University "Neofit Rilski" of May 27, 2015, Protocol No 41.

CURRICULUM

FIELD OF STUDY: INFORMATION SYSTEMS AND TECHNOLOGIES,

DURATION OF STUDY: 4 YEARS (8 SEMESTERS),

DEGREE: BACHELOR OF COMPUTER SCIENCE

First Year

Fall semester	ECTS credits	Summer semester	ECTS credits
Compulsory Courses		*Compulsory Courses*	
Fundamentals of programming	6.0	Computer mathematics 2	6.0
Web Systems and technologies	4.5	Database	6.0
Introduction in information systems and technologies	4.5	Operation systems	6.0
Computer mathematics 1	6.0	Mathematical logic	4.5
Graphic design	6.0	E-trading and corporate information systems	4.5
English language 1	3.0	English language 2	3.0
Sport	0.0	Sport	0.0
Total	**30**	**Total**	**30**

Second Year

Fall semester	ECTS credits	Summer semester	ECTS credits
Compulsory Courses		*Compulsory Courses*	
Development of expert systems	6.0	Modern languages and programming environments	4.5
Database management systems	4.5	Coding theory and combinatorics	6.0
Computer architectures	4.5	Algorithms in graphs and network	6.0
Discrete mathematics	6.0	Mathematical optimization	6.0
Network and system administration	4.5	Optional course 1 (with 4.5 credits)	4.5
Optional course 1	4.5	Optional course 2 (with 3.0 credits)	3.0
Sport	0	Sport	0.0
Optional Courses (1 course)		*Optional Courses* (1 course)	
Number theory	4.5	Data analysis with MS Excel and VBA	4.5
Training in IT company	4.5	Programming with .NET Framework	4.5
Discrete functions	4.5	Graph theory	4.5
Special matrices	4.5	Introduction in LATEX 2ε	4.5
Development of object-oriented applications with design patterns	4.5	Graphic design of printed and promotional materials	4.5
Introduction to XML	4.5	Programming with Ruby	4.5
		Optional Courses (1 course)	
		Pattern recognition	3.0
		Mathematical models in economics	3.0
		Matroid theory	3.0
		Separable sets of variables	3.0
		Language culture	3.0
Total	**30**	**Total**	**30**

Third Year			
Fall semester	**ECTS credits**	**Summer semester**	**ECTS credits**
Compulsory courses		*Compulsory courses*	
Analysis and synthesis of algorithms	6.0	Software quality assurance	6.0
Computer security	6.0	Web content management	7.5
Theoretical foundations of informatics	6.0	Probability and statistic	7.5
Numerical analysis	7.5	Optional course 1	4.5
Optional course 1	4.5	Optional course 2	4.5
Optional courses (1 course)		*Optional courses* (2 courses)	
Operational research	4.5	Practical course in databases	4.5
Mathematical fundamentals of computer graphics	4.5	Practicum in logic programming	4.5
Mathematical theory of database	4.5	Workshop on asynchronous and parallel programming with the .NET Framework	4.5
Programing with Object Pascal and Delphi	4.5		
Programming with C++ Builder	4.5	Bitwise operations, graphs, and combinatorial applications	4.5
JavaScript programming	4.5		
Domain specific languages	4.5	Management and financing of educational and scientific programs	4.5
		Design and development of Human Computer Interactions	4.5
		Norms and Standards of Information Security	4.5
Total	**30**	**Total**	**30**

Fourth Year			
Fall semester	**ECTS credits**	**Summer semester**	**ECTS credits**
Compulsory courses		*Compulsory courses*	
Internet programming	6.0	Software engineering	5.0
Application for mobile devices	6.0	Protecting intellectual property rights	1.5
Specialized statistical software	6.0	Knowledge management	4.5
Optional course 1	6.0	Optional course 1	4.5
Optional course 2	6.0	Optional course 2	4.5
		State exam or defense of graduate thesis	10.0
Optional courses (2 courses)			
Applied statistic	6.0	*Optional courses* (2 courses)	
Web-based expert systems	6.0	Computer models in the natural sciences	4.5
Numerical optimization	6.0	Images recognition	4.5
Object-oriented and distributed databases	6.0	Internet technologies	4.5
Multimedia databases	6.0	Information security	4.5
Algorithms for decision making in management and economics	6.0	Developing database applications	4.5
		Information retrieval and web search	4.5
Interactive multimedia technologies	6.0	Methods and tools for computer systems integration	4.5
NoSQL Databases	6.0		
Metadata	6.0		
XML standards for file formats of MS Office	6.0		
Total	**30**	**Total**	**30**

DECRIPTION OF THE COURSES AT THE FIRST YEAR

FUNDAMENTALS OF PROGRAMMING

Semester: 1 semester

Type of Course: lectures and tutorials in computer lab

Hours per week: 2 hours lecture and 2 hours tutorials in computer lab/ autumn semester

ECTS Credits: 6 credits

Department: Informatics

Course Status: Core course.

Course description: The course is an introduction in programming using MS Visual Basic .Net as programming language. Topics about algorithms, data types, variables, expressions, arrays, procedures, functions, and object-oriented programming are covered. The course assumes no or little prior knowledge of programming.

Objectives: The students should obtain basic knowledge and skills in problem solving using structured or object-oriented approaches in programming.

Methods of teaching: Lectures, tutorials, discussions, project based method.

Requirements/Prerequisites: No

Assessment and Evaluation: Written final exam

Registration for the Course: core course

Registration for the Exam: The course is compulsory

References:

1. Schneider D., An Introduction to Programming Using Visual Basic Int. Ed., Prentice Hall, Pearson Education Inc., 9th Ed 2014, (8th Ed 2010).
2. Дамянов И., (2012) Увод в програмирането, УИ "Неофит Рилски", ISBN 978-954-680-830-1, COBISS.BG-ID – 1248729572
3. Conrod, P. & Tylee. L. (2019). Learn Visual Basic 2019 Edition: a step-by-step programming tutorial. S.l.: KIDWARE SOFTWARE.
4. Zak, D., Programming with Microsoft Visual Basic 2012, Course Technology, Cengage Learning, 6th Ed. 2014

WEB SYSTEMS AND TECHNOLOGIES

Semester: 1st semester

Course Type: seminar and lab

Hours per week/SS: 1 seminar hour and 2 labs hours per week/FS

ECTS credits: 4.5 credits

Department: Informatics

Course Status: Compulsory Course in the Information Systems and Technologies in Bachelor 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, XHTML, CSS, and through them to create websites.
- 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 – 2, 3, 4, 5, 6. Evaluation of current control is obtained by taking the average of the assessment of coursework and tasks solved during the semester. 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: Not necessary

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

References:

1. Giovanni Difeterici, The Web Designer's Roadmap, SitePoint, 2012
2. Jason Beaird, The Principles of Beautiful Web Design, SitePoint, 2010
3. Steve Fulton and Jeff Fulton, HTML5 Canvas, 2nd Edition, O'Reilly Media, 2013
4. Bill Scott and Theresa Neil, Designing Web Interfaces, O'Reilly Media, 2009
5. Lara Callender Hogan, Designing for Performance, O'Reilly Media, 2015
6. António Pratas, Creating Flat Design Websites: Design and develop your own flat design websites in HTML, Packt Publishing, 2014
7. Jörg Krause, Introducing Web Development, Apress, 2016
8. Joshua Johanan, Talha Khan and Ricardo Zea, Web Developer's Reference Guide, Packt Publishing, 2016
9. Jason Gonzales, Mobile First Design with HTML5 and CSS3, Packt Publishing, 2013
10. Brian P. Hogan, Web Design for Developers: A Programmer's Guide to Design Tools and Techniques, The Pragmatic Bookshelf, 2009
11. Peter Gasston, Multi-Device Web Development with HTML5, CSS3, and JavaScript, No Starch Press, 2013
12. Clarissa Peterson, Learning Responsive Web Design, O'Reilly Media, 2014
13. Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP.NET 4 in C# and VB, Wiley Publishing, 2010
14. Dafydd Stuttard and Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Second Edition, Wiley Publishing, 2011
15. Alexis Goldstein, Louis Lazaris, and Estelle Weyl, HTML5 & CSS3 for the Real World, Sitepoint, 2015
16. Aditya Ravi Shankar, Pro HTML5 Games: Learn to Build your Own Games using HTML5 and JavaScript, 2nd Edition, Apress, 2017
17. Flanagan and S.M. Maniatis, Intellectual Property on the Internet, University of London, 2008; http://www.londoninternational.ac.uk/sites/default/files/intellectual_property_internet.pdf
18. WIPO, The Enforcement of Intellectual Property Rights: A Case Book, 2012; http://www.wipo.int/edocs/pubdocs/en/intproperty/791/wipo_pub_791.pdf
19. Денис Колисниченко, HTML 5 & CSS 3 практическо програмиране за начинаещи, изд. Асеневци, 2012
20. Жюстин Томас, Програмиране на WEB дизайн, изд. Нови знания, 2013
21. Алдениз Рашидов, HTML, XHTML & CSS, изд. Асеневци, 2012
22. Сергей Соколов, CSS3 в примери, изд. Асеневци, 2012

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, responive, 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

Abbreviation:

FS: Fall Semester
SS: Spring Semester

INTRODUCTION IN INFORMATION SYSTEMS AND TECHNOLOGIES

Semester: 1 semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 1 hours tutorials in computer lab/autumn semester.

Credits Numbers: 4,5 credits

Department: Informatics

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 od IS ets. 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 65% 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. Ralph M. Stair, George W. Reynolds, Fundamentals of Information Systems, Sixth Edition, 2012 Course Technology, Cengage Learning
2. BRIAN K. WILLIAMS, I. STACEY C. SAWYER, Using Information Technology. A Practical Introduction to Computers & Communications, McGraw-Hill, 2011

3. URL http://www.e-learning.swu.bg

GRAPHIC DESIGN

Semester: 1 semester

Type of Course: lectures and labs

Hours per week: 2 lectures, 2 labs per week

ECTS Credits: 6,0

Department: Informatics

Course Status: Compulsory course from the Computer Science Bachelor Curriculum.

Course description: The course aims to introduce students to the theoretical foundations of graphic design and its importance to information technology. Software for creating and editing raster and vector images are used to illustrate the studied theory. The knowledge that students will gain will help them create and edit various graphic objects, create graphic galleries, know the rules for good design, and can select appropriate colors and fonts. The course is adapted towards the students of the "Information Systems and Technologies" specialty, at South-West University "Neofit Rilski" Blagoevgrad. It is the bases of the courses in Graphic Design of Printed and Promotional Materials, Mathematical Foundations of Computer Graphics, and Mobile Applications Development.

Course Objectives: This course aims to provide students with knowledge and additional training in the theory and practice of graphic design. They will learn about the methods of digital image processing, how to create vector and raster graphics and animation.

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

Requirements: Needed basic knowledge of information technology.

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: Not necessary.

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

References:

1. M. Monteiro (2012) "Design is a job", A Book Apart

2. P. Whitt (2016) "Pro Photo Colorizing with GIMP", Apress.
3. J. M. Ferreyra (2011) "GIMP 2.6 Cookbook", Packt Publishing.
4. T. Bah (2017) Inkscape: Guide to a Vector Drawing Program, 5th Edition; http://tavmjong.free.fr/INKSCAPE/MANUAL/html/.
5. B. Hiitola (2016) "Inkscape 0.48 Starter", Packt Publishing.
6. M. Jurkovic R. Di Scala (2011) "Inkscape 0.48 Illustrator's Cookbook", Packt Publishing.
7. W. Jackson (2015) "Digital Illustration Fundamentals", Apress.
8. L. Mathis (2016) "Designed for Use", 2nd Edition, Pragmatic Programmers.
9. J. Shariat, and C. S. Saucier (2017) "Tragic Design", O'Reilly Media.
10. D. Walsh (2015) "2D Game Art", AtomicVertex.com.
11. J. DiMarco (2010) "Digital Design for Print and Web", Wiley.
12. N. Iliinky, J. Steele (2011) "Designing Data Visualizations", O'Reilly Media.
13. J. Jatz (2012) "Designing Information. Human factors and common sense in information design", Wiley.
14. P. Shirley, S. Marschner (2009) "Fundamentals of Computer Graphics", CRC Press.
15. К. Уилкинсън (редактор) (2014) „Знаци и символи. Илюстрован справочник за техния произход и значение", Книгомания.
16. Ст. Малешков, В. Георгиев (2014) „Компютърна графика и фотореалистична визуализация", Нов български университет.
17. В. Гличка (2016) Основи на векторната графика, Алекс Софт.
18. J. M. Blain (2016). The Complete Guide to Blender Graphics: Computer Modeling & Animation. AK Peters/CRC Press.
19. L. Flavell (2011). Beginning Blender: Open-Source 3D Modeling, Animation, and Game Design. Apress.

Abbreviation:

FS: Fall Semester

COMPUTER MATHEMATICS 1

Semester: 1 semester

Type of Course: lectures and tutorials in computer lab

Hours per week - 2 hours lectures and 2 hours tutorials in computer lab/winter semester

Credits Numbers: 6 credits

Department: Informatics, Tel.: +359 73 8889 132

Course Status: Compulsory course in curriculum of major Computer Mathematics I. Bachelor degree.

Course description:

It includes basic concepts, principles and methods in the field of calculus, linear algebra and analytical geometry, and their practical applications, also possibility to apply new IT in this area.

Objectives:

- The students should obtain knowledge of:
- To apply the methods of calculus, linear algebra and analytical geometry in practice
- To realize concrete applications with tools of IT.

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

Pre- requirements: Mathematics and IT

Assessment and Evaluation

Projects- 75%
Final Test- 25%

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

ENGLISH LANGUAGE 1

Semester: First semester

Course type: Seminars

Hours (weekly): 2 hours per week/FS

Number of ECTS credits: 3

Department: Informatics

Type of the course in the curriculum: Compulsory course in the "Information System and Technologies" B. S. Curriculum

Course description: The course in practical English for "Computer systems and technologies" is aimed at mastery of the basic language skills corresponding to the first level - Elementary. The course is starting construction of communicative competence as the ability to understand and draw meaningful oral and written statements in accordance with the rules of English. During the training, students expand and deepen their knowledge and language skills in English, acquired in high school, that build on old knowledge, assimilated and new learning material and form strategies for self-study and improvement. It is envisaged that during the absorption of specific pedagogical and technical terminology, which will allow students to navigate the English language literature. At the end of the course students should be able to listen, read and understand

different texts in English to talk on specific topics, to express themselves orally and in writing their views on an issue.

Course goals: Familiarizing students with the peculiarities of speech presentation and etiquette dating in formal and informal environment. Presentation of the most common vocabulary related to everyday life, family, work, leisure. Learning the meaning and use of personal and possessive pronouns, the forms of the present simple tense, membership and the formation of plural nouns. Absorption of some forms of speech etiquette: apology, congratulations, gratitude, etc.

Teaching methods: Seminars

Prerequisites: None

Examination and assessment procedures: Continuous assessment during the semester (two tests).

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

Registration for examination: coordinated with the lecturer and the academic affairs department

References:

1. Soars, John & Liz, New Headway Elementary - fourth edition, Oxford University Press, 2011
2. Soars, John & Liz, New Headway Pre-Intermediate - fourth edition, Oxford University Press, 2012
3. Raymond Murphy, English Grammar in Use, fourth edition with answers, Cambridge University Press, 2012
4. Дончева, Лилия, Английски глаголни времена, Skyprint, 2009
5. Ранкова, М., Иванова, Ц., Английска граматика, Наука и изкуство, София, 2010
6. Carter, R., McCarty, M., Mark, G., O'Keeffe, A., English Grammar Today: An A-Z of Spoken and Written Grammar, Cambridge University Press, 2011

Notes:

FS: Fall semester
SS: Spring semester

COMPUTER MATHEMATICS 2

Semester: 2 semester

Course Type: lectures and lab exercises

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

ECTS Credits: 6 credits

Department: Informatics, telephone: 073 / 588 532

Course Status: Compulsory Course in the Information Systems and Technologies B.S. Curriculum

Course Description: The course in Computer mathematics 2 includes basic mathematical methods of Analysis and Algebra, Relations and Functions and their properties, Elements of General Algebra, Combinatorics, Number Theory, Graph Theory, Analysis of Algorithms, Integral and Differential Calculus.

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

Teaching Methods: lectures and lab exercises

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: two current problem tests (50%), project (20%) and computer final test exam (30%).

Registration for the Course: not necessary

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

Abbreviation:

FS: Fall Semester
SS: Spring Semester

DATABASE

Semester: 2 semester

Course Type: lectures and exercises

Hours per week/FS/SS: 2 lectures and 2 exercise week/SS

ECTS credits: 6.0 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Science Master Curriculum.

Course Description: This course relies on primary readings from the database community to introduce graduate students to the foundations of database systems, focusing on basics such as the relational algebra and data model, schema normalization, query optimization, and transactions.

Teaching Methods: Lectures.

Requirements/Prerequisites: Knowledge in Mathematics.

Exam: Final exam

Registration for the course: No

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

References:

Basic:

1. Записки от лекции.
2. Павел Азълов. Бази от данни. Релационен и обектен подход, техника, 1991 г.
4. Юлиана Пенева, Бази от данни. I част. София, ИК "Регалия " 6, 2003 г.
5. Ullman, J., Widom, J., DATABASE SYSTEMS The Complete Book (2rd ed), Upper Saddle River, 2009, New Jersey.
6. Toby J. Teorey , Sam S. Lightstone , Tom Nadeau, H.V. Jagadish, Database Modeling and Design Database Modeling and Design, 2012, Morgan Kaufmann Press.
7. Rex Hogan. (2018) A Practical Guide to Database Design, CRC Press, USA.

Additional:

1. Shepherd J.C. Database management: Theory and Application. Irwin Inc.,USA 1990.
2. Мейер Д.р Теория релационных 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:

FS: Fall Semester
SS: Spring Semester

OPERATION SYSTEMS

Semester: 2 semester

Type of Course: lectures and tutorials in computer lab

Hours per week: 2 hours lecture and 2 hours tutorials in computer lab/ autumn semester

ECTS Credits: 6 credits

Department: Informatics

Course Status: Core course.

Course description: The course is introduction in area of operation systems. Basic knowledge and skills in Linux and Microsoft Windows are covered.

Objectives:
The student should obtain knowledge of:

- Basic principles of operation systems.
- Basic administration skills in area of operation systems.

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

Pre- requirements: Fundamentals of Programming, Introduction to IST

Assessment and Evaluation

Pre-exam test – 30%

Final Test- 70%

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

Registration for the Course: core course

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

References

1. Лилян Николов, Операционни системи, ИК "Сиела", София, 2009.
2. William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall, 2011.

MATHEMATICAL LOGIC

Semester: 2 semester

Course type: Lectures

Hours (weekly) / SS /: lectures: 2 hours per week and seminars: 1 hour per week / SS

Number of ECTS credits: 4.5

Department: Informatics

Type of the course in the curriculum: Compulsory course from the curriculum of the "Information Systems and Technology" Bachelor's degree program

Course description: The course in mathematical logic aims to teach the basic concepts and results of propositional and predicate logic and propositional and predicate calculus. It deals with concrete first-order theories.

Goal: The course in mathematical logic is aimed at introducing students to the development of concepts and methods of mathematical logic within the context of development in mathematics.

Teaching methods: lectures, demonstrations, problem solving

Prerequisites: The acquired knowledge is useful.

Examination and assessment procedures: The estimation of the acquired knowledge is based on a written exam which consists of problem solving and theoretical knowledge examination (writing on a topic from the syllabus provided to students)

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

Registration for examination: coordinated with the lecturer and the academic affairs department

References:

Basic

1. Введенеие в математическиую логику, Е. Менделсон, "Наука", Москва 1976
2. Сказки по логика, С.Паеи и колектив, УИ "Кл.Ожридеки", София 1990
3. Приицесса или тигр?, Р. Смаллиан, "Мир", Москва 1985

Additional

1. A concept of logic, Seventh edition. Hurley, Springer, 2009, http://ihtik.lib.ru/2012.03_ihtik_mathematic/
2. Set Theory and Logic, Robert Roth Stoll, Springer 2009
3. Applied Computer Science, Shane Torbert, 2011
4. Concise Guide to Computation Theory, Akira Maruoka, 2011-
5. How to Solve It: A New Aspect of Mathematical Method, George Pólya, 2008

Notes:

SS: Spring semester

E-TRADING AND CORPORATE INFORMATION SYSTEMS

Semester: 2 semester

Type of Course: lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 1 hours tutorials in computer lab/ spring semester.

ECTS Credits: 4,5 credits

Department: Informatics

Course Status: Core course in curriculum of major IST, Bachelor's degree.

Course description: The course is an introduction to e-business and corporate information systems.

Objectives: The student should obtain knowledge of:

- The specifics of the most common technologies used in e-commerce and corporate information systems.
- Electronic document circulation.

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

Pre- requirements: Web systems and technologies (core course)

Assessment and Evaluation

Project- 50%

Final Test- 50%

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

Registration for the exam: coordinated with the lecturer and the Student Service Office

References:

1. Turban, E., Volonino, L., Wood G., Information Technology for Management, 11th ed., Wiley, 2018
2. Ralph M. Stair, George W. Reynolds, Fundamentals of Information Systems, 9th ed., Cengage Learning, 2018
3. Williams, B., Sawyer, S., Using Information Technology: A Practical Introduction to Computers & Communication: Complete Version, 11th ed., McGraw Hill, 2015

ENGLISH LANGUAGE 2

Semester: 2 semester

Course Type: seminarsя

Hours per week FS/SS: 2 classes per week/SS

ECTS credits: 3 credits

Department: Department of Informatics, telephone: 073 / 588 532, e-mail: bogdanf@abv.bg

Course Status: Compulsory Course in the Information System and Technologies B. S. Curriculum

Course Description: The English language course – part II aims at mastering and improving the skills and knowledge, acquired during the first part of the course. The students become acquainted with advanced grammatical categories and verb tenses like Past Continuous Tense, Present Perfect Continuous Tenses, Past Perfect Tense, modal verbs, Reported Speech, etc. The course widens the lexical scope that is taught, and emphasizes on its practical application in translations, essays, discussions. Via suitable English-Bulgarian and Bulgarian-English translations the students practice the new lexis and learn technical terms from the sphere of computer science and information technologies.

Course Goals: The goals of the course are to enable students to speak and write effectively and confidently in their professional and personal lives. Students become acquainted with the basic terminology in the specific field.

Teaching Methods: Seminars

Requirements/Prerequisites: Elementary level of English language competence

Assessment: Continuous assessment during the semester (two tests)

Registration for the Course: not necessary

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

References:

1. Soars, John & Liz, New Headway Elementary - fourth edition, Oxford University Press, 2011
2. Soars, John & Liz, New Headway Pre-Intermediate - fourth edition, Oxford University Press, 2012
3. Raymond Murphy, English Grammar in Use, fourth edition with answers, Cambridge University Press, 2012
4. Дончева, Лилия , Английски глаголни времена, Skyprint, 2009
5. Ранкова, М., Иванова, Ц., Английска граматика, Наука и изкуство, София, 2010
6. Carter, R., McCarty, M., Mark, G., O'Keeffe, A., English Grammar Today: An A-Z of Spoken and Written Grammar, Cambridge University Press, 2011.

Abbreviation:

FS: Fall Semester

SS: Spring Semester

DECRIPTION OF THE COURSES AT THE SECOND YEAR

DEVELOPMENT OF EXPERT SYSTEMS

Semester: 3 semester

Type of Course: lectures and labs

Hours per week: 2 lectures and 2 labs per week

ECTS Credits: 6,0

Department: Informatics

Course Status: Fundamental course from the Computer Science Bachelor Curriculum.

Course description: Artificial Intelligence has come out of the closets of the scientists and has found increasing application in the engineering and business world. While design and manufacture of hardware is generally associated with the engineering attribute, the concept of engineering of knowledge has only recently come under discussion. Principles of engineering have been applied to the planning and development of software, i.e. software engineering has evolved as a discipline in computer science that uses such methods as analysis of requirements, specifications, planning and modular design, prototyping, and implementing the design in appropriate programming languages, and finally, operational application. Knowledge Engineering goes beyond software engineering in that Knowledge bases are created that incorporate know-how and knowledge of experts in domain-specific knowledge stores which, in contrast to simple data bases, have learning and reasoning power. This course develops two parallel approaches to knowledge engineering: For one, the lecture is designed to discuss the fundamentals of artificial intelligence as it applies to knowledge engineering and the development of expert systems. The second part of this course is devoted to the practical application of the concepts: The students, under the guidance of the professor, will learn to develop mini-expert systems of their choice that will incorporate the concepts of expert systems and the techniques of knowledge engineering to assist practitioners in different fields (e.g. auto mechanic, medical doctors, etc.) in diagnosing malfunctions and/or projecting potential solutions to problem.
This course presents an in-depth examination of expert or knowledge-based systems. Topics to be covered include architectures, knowledge representation structures, building techniques, and design tools and shells for constructing expert systems; the life-cycle of expert systems; and evaluating expert systems. Details of specific expert systems and expert system shells will be covered.

Basic objectives and tasks: The main objective of this course is to provide the students with an understanding of the principles of knowledge engineering and the design and development, planning, and management of an expert system.

1. To explain what Expert System (ES) is: Definition, history, and general concept; Characteristic, advantages and limitations; Types and examples; Architecture and components; Development process; Inference engine; Knowledge base; Uncertainty factor; Knowledge acquisition; Expert system's development tools
2. To give students opportunity to be creative on applying their ability by developing an ES. There will be a final task completed in a group

Methods of teaching: lectures, projects, other methods

Pre- requirements: Basic knowledge in Informatics, Mathematical logic, and Programming languages.

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. Jackson, P. Introduction to Expert Systems (3rd ed.). Addison-Wesley, 1998
2. Russell, S., P. Norvig. Artificial Intelligence: A Modern Approach (3rd ed.). Pearson Education Ltd., 2010.
3. Joseph C. Giarratano, Gary D. Riley, Expert Systems: Principles and Programming, Course Technology, 2005

DATABASE MANAGEMENT SYSTEMS

Semester: 3 semester

Course Type: tutorials and laboratory

Hours per week FS/SS: 1 tutorial and 2 laboratory hours per week / FS

ECTS credits: 4.5 credits

Department: Department of Informatics

Course Status: Compulsory Course in the Information System and Technologies B. S. Curriculum

Course Description: The course includes basics of database management systems and related topics: introduction to the database management systems, requirements, architecture and basic principles of operation; comparison between the most widely used database management systems; basics of planning, installing, configuring and managing components of a DBMS and its instances; tools for working with database management systems, familiarization with the tools SQL Server Management Studio and IBConsole; design of relational databases and create a physical diagram of database scheme in the DBMS; create and modify tables in the DBMS, use

types, expressions and functions; defining keys and restrictions when creating relationships between tables, creating and using indexes, working with diagrams in the DBMS; working with SQL statements INSERT, DELETE, and UPDATE with insert, delete and update data; working with the SQL statement SELECT retrieving data; working with joins in extracting information from multiple tables, creating and using views; create and work with stored procedures in the DBMS, define custom functions; working with transactions and locks in the DBMS; create and use triggers in the DBMS; security system DBMS, working with logins, roles and users, authentication and authorization; exporting and importing data, DBMS capabilities for backup and restore databases.

Course Aims: Students should obtain basic knowledge and skills for database management systems.

Teaching Methods: Tutorials and laboratory

Requirements/Prerequisites: Databases.

Assessment: Written final exam

Registration for the Course: Not necessary

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

References:

1. C. J. Date. An Introduction to Database Systems. Eighth Edition. Pearson. 2003.
2. Elmasri, R., Navathe, S. Fundamentals of Database Systems. Sixth Edition. Pearson. 2013.
3. C. J. Date. SQL and Relational Theory: How to Write Accurate SQL Code. Second Edition. O'Reilly Media. 2011.
4. A. Jorgensen, P. LeBlanc, J. Chinchilla, J. Segarra, A. Nelson. Microsoft SQL Server 2012 Bible. John Wiley & Sons, Inc. 2012.
5. O. Thomas, P. Ward, B. Taylor. Administering Microsoft SQL Server 2012 Databases. Microsoft Press. 2012.
6. P. Atkinson, R. Vieira. Beginning Microsoft® SQL Server® 2012 Programming. John Wiley & Sons, Inc. 2012
7. R. Dewson. Beginning SQL Server for Developers. Fourth Edition. Apress. 2015.

Additional Titles

1. C. J. Date. Database Design and Relational Theory: Normal Forms and All That Jazz (Theory in Practice). First Edition. O'Reilly Media. 2012.
2. C. J. Date. Database in Depth: Relational Theory for Practitioners: The Relational Model for Practitioners. First Edition. O'Reilly Media. 2005.
3. Basit A. Masood-Al-Farooq. SQL Server 2014 Development Essentials. Packt Publishing. 2014.

Abbreviation:

FS: Fall Semester
SS: Spring Semester

COMPUTER ARCHITECTURES

Semester: 3 semester

Form of the course: Lectures/seminars

Hours (per week): 2 hours lectures + 1 hours exercises per week, Fall semester

Credits: 4.5 credits

Department: Informatics, Faculty of Mathematics and Natural Sciences, Southwest University "Neofit Rilsky" – Blagoevgrad, phone +359-73-588 532

Status of the course in the educational plan: Compulsory Course in the Information System and Technologies B. S. Curriculum

Description of the course: The course covers the advanced computer systems, their programming and functional model, introduce information in computer organization and memory types (major, operational, permanent, outdoor, etc.), system interruptions, features and technology solutions, conveyor ADP modes, system bus (types and structures), some problems of modern computer architectures (RISC, parallel and multiprocessor computer systems).

Scope of the course: Obtaining knowledge of a systematic overview of the modern computer architecture, systems to form the theoretical and practical basis for better understanding of the work of computers to acquire skills in programming in assembly language.

Methods: discussions, practical exercises of the codes under consideration

Preliminary requirements: The students must have basic knowledge from mathematics.

Evaluation: permanent control during the semester (two written exams) and final exam.

Registration for the course: by application in the Educational Office

Registration for exam: up to agreement with the teacher and the Educational Office

Literature:

Basic

1. Hennessy John L. and David A. Patterson, Computer Architecture, Fifth Edition: A Quantitative Approach (The Morgan Kaufmann Series in Computer Architecture and Design) (5th Edition), 2011.
2. Боровска Пламенка, Компютърни системи, второ преработено издание, Сиела, София, 2007
3. Брадли, Д. "Програмиране на асемблер за персонален компютър IBM/PC" Техника, София, 1989
4. Иванов Р. "Архитектура и системно програмиране за Pentium базирани компютри", Габрово, 1998.

5. J. L. Hennessy, D. A. Patterson. Computer Architecture: A Quantitative Approach (3rd ed.). Morgan Kaufmann Publishers, 1996.
6. Боровски Б., Боровска П., Архитектура на ЕИМ и микрокомпютри, Техника, 1992.
7. Горслайн Дж., Фамилия ИНТЕЛ, Техника, 1990.
8. Въчовски И., Наръчник по 32-разредни микропроцесори.
9. Скот Мюлер, Компютърна енциклопедия, Част 1, 2, 3, СофтПрес 2002 г.
10. Бари Прес, Компютърна библия I и II част, АлексСофт,1998 г.
11. ШиндлерД., Компютърни мрежи, СофтПрес, 2003 г.
12. Людмила Иванова, Въведение в PC, изд. БАН, 2007 г.

Web

1. http://www.computers.bg
2. http://www.hardwarebg.com
3. http://www.comexgroup.com
4. http://www.webopedia.com
5. http://www.sagabg.net
6. http://benchmarkhq.ru
7. http://csg.csail.mit.edu/6.823/lecnotes.html , достъпни към май 2013

Additional

1. Wikipedia.ORG - Internet енциклопедия.
2. 3DNow: Technology Manual
3. S. Bondeli, Divide and conquer: A parallel algorithm for the solution of a tridiagonal linear system of equations, Parallel Computing, 1991
4. Intel Corp. Intel Pentium 4 and Intel Xeon Processor Optimization Manual 2001
5. David Culler, Parallel Computer Architecture: A hardware software Approach, Morgan Kaufmann, 1998
6. Брайант Рэндал Э., Дэвид О'Халларон , Компьютерные системы: архитектура и программирование Computer Systems: A Programmer's Perspective, Издательство: БХВ-Петербург, ISBN 5-94157-433-9, 0-13-034074-X; 2005.
7. file://localhost/D:/My%20Doc/KA/Engl_KA/KA_master_engl/From%20one%20to%20another%20number%20system%20-%20CodeProject.mht

DISCRETE MATHEMATICS

Semester: 3th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lecture and 2 labs per week / WS

ECTS Credits: 6 credits

Department: Department of Computer Science

Course status: Fundamental course from the Computer Science Bachelor Curriculum.

Course description: The Course is an Introduction in Discrete Structures used as a mathematical model in different computer science areas: logic, operations and relations in finite algebraic structures, representations of them as data structures, Boolean algebras, graphs, complexity of algorithms, combinatorics, finite automata etc.

Objectives: Nontrivial introduction in some important for Computer science areas, allowing the students to effectively use their knowledge in solving combinatorial problems.

Methods of teaching: lectures, tutorials, group seminars or workshop, projects, other methods

Pre - requirements: Basic knowledge in Mathematics.

Support teaching materials: Textbook and manual of the course are published, instructions for every laboratory theme and exemplary programs; access to web sites via Internet.

Exam: Written examination 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. Й. Денев, С. Щраков "Дискретна математика." ЮЗУ Благоевград, 1995.
2. К. Йорджев, М. Тодорова, С. Щраков "Ръководство за решаване на задачи по дискретна математика" ЮЗУ Благоевград, 2004
3. Й. Денев, Р. Павлов, Я. Деметрович "Дискретна математика."София, Наука и изкуство, 1984.
4. Р. Хаггарти Дискретная математика для программистов ,Москва: Техносфера, 2004
5. ЖильцоваЛ.П., Смирнова Т.Г. Основы теории автоматов и формальных языков в примерах и задачах: учебно-методическое пособие. –[электронный ресурс] – Нижний Новгород: Нижегородский госуниверситет, 2017. –64 с
6. Андерсон, Джеймс А., Дискретная математика и комбинаторика.:Пер. с англ. — М. : Издательский дом "Вильяме", 2004. — 960
7. Р. Павлов "Математическа лингвистика." София, Народна просвета, 1982.
8. К. Йорджев, Побитови операции, графи и комбинаторни приложения. ЮЗУ „Н. Рилски", ISBN 978-954-680-961-2, 2014
9. Капитонова Ю. В. и др. Лекции по дискретной математике / Авторы: Ю. В. Капитонова, С. Л. Кривой, А. А. Летичевский, Г. М. Луцкий / - СПб.: БХВ- Петербург, 2004. — 624 с: ил.
10. Т. Фудзисава, Т. Касами "Математика для радиоинженеров. Теория дискретных структур." Москва, Радио и связ, 1984.

11. А. Ахо, Дж. Ульман "Теория синтаксического анализа, перевода и компилации" Москва, Мир, 1978.
12. С. Гинсбург "Математическая теория контекстно-свободных языков" Москва, Мир, 1970.

NETWORK AND SYSTEM ADMINISTRATION

Semester: 3th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 1 lecture and 2 labs per week / WS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Systems and Technologies Bachelor Curriculum.

In this course are discussed the basic actions and problems related to network and systems administration of Linux and Windows based systems. The course is aimed at providing the necessary skills needed to perform nearly all important administration activities required to manage a Linux and Windows network and systems configuration, the basic setup and management of the most commonly used Internet services.

Course Objectives: The course is aimed at introducing to students the common concepts in network and systems administration by discussing the basic activities regarding the administration of a Linux and Windows network configuration.

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

Requirements/Prerequisites: Needed basic knowledge of operating systems, programming, computer architectures, computer networks and communications.

Assessment: written final exam

Registration for the Course: the course is compulsory

References:

1. Христов В. Киров Н.,"Основи на компютърните мрежи и интернет", ЮЗУ "Н.Рилски" –Благоевград, 2012
2. Боровска П., Компютърни системи. София, Сиела, 2010 г.
3. Боянов. К. и кол. Компютърни мрежи. Интернет, София, НБУ, 2003.
4. Olaf Kirch & Terry Dawson, Linux Network Administrators Guide (2001)
5. Алдениз Рашидов. Инсталиране и конфигуриране на Web сървъри под Linux и Windows (2012)

6. VirtualBox User Manual – безплатна книга - http://download.virtualbox.org/virtualbox/5.0.2/UserManual.pdf
7. Безплатни книги от Microsoft Virtual Academy - http://www.microsoftvirtualacademy.com/ebooks
8. Lawrence E. Hughes. The Second Internet: Reinventing Computer Networking with IPv6 (2010)
9. Raphaël Hertzog, Roland Mas. The Debian Administrator's Handbook (2012)
10. Ron Aitchison. Pro DNS and BIND 10 (2011)
11. Ronald Bardford. Effective MySQL Backup and Recovery (2012)
12. Ronald Bardford, Chris Schneider. Effective MySQL Replication Techniques in Depth (2013)
13. Ашок Апу, Администриране и защита на Apache Server, DuoDesign, (2004)

NUMBER THEORY

Semester: Third semester

Form of the course: lectures

Hours (per week): 3 hours lectures

Credits: 4,5 credits

Department: Informatics, Faculty of Mathematics and Natural Sciences, Southwestern University "Neofit Rilsky" – Blagoevgrad, phone 073 588 532

Status of the course in the educational plan: The course is optional in BSc curriculum of the Computer Systems and Technologies.

Description of the course: The course starts with introduction of the foundation of the number theory: divisibility, initial theory of the congruence, the main theorem of the Arithmetic, the theorems of Fermat and Euler. The structure of the group of remainders which are relatively prime with the module is considered. The theory of the congruencies of one and several unknowns is developed. The quadratic residues are introduced and the criterion of Euler is proved. Some Diophantine equations and the function [x] are considered.

Scope of the course: Obtaining knowledge of the theoretical backgrounds and practical abilities for applications of the Number theory.

Methods: lectures, discussions on the methods of solving congruencies, other problems from the Number theory.

Preliminary requirements: The students must have basic knowledge from the high school courses and elementary notions of the group theory.

Evaluation: permanent control during the semester (two written exams) and exam in the semester's end in two parts – problems solving and answering theoretical questions.

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

Registration for exam: up to agreement with the teacher and the Educational Office

Literature:

1. С. Додунеков, К. Чакърян. Задачи по теория на числата, Регалия, 1999.
2. Записки (www.moi.math.bas.bg/~peter).
3. T. Andreescu, D. Andrica, Number Theory, Birkhauser, 2009

TRAINING IN IT COMPANY

Semester: 3 semester

Type of Course: Extracurricular occupation

ECTS Credits: 4.5 credits

Department: Informatics

Course Status: Elective course in 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 who 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, Programming.

Assessment: report; journal of the conducted practical training;

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

DISCRETE FUNCTIONS

Semester: 3 semester

Course Type: lectures and seminar

Hours per week FS/SS: 2 lecture hour and 1 seminar hours per week /FS

ECTS credits: 4.5 credits

Department: Department of Informatics, telephone: 073 / 588 532

Course Status: Optional Course in the Information System and Technologies B. S. Curriculum

Course Description: Students learn basic sections of:

- Functional constructs in k-valued logic
- Substantial and highly significant dependence of the functions of k-valued logic on their arguments
- The complexity of implementation of binary functions
- Logical methods of analysis and synthesis of circuits.

Teaching methods: In the lecture hours key issues are discussed. The discussions are detailed in the hours for exercise. In these classes students report their results of doing independent work.

Prerequisites: Knowledge of mathematical logic.

Evaluation: Paper or written exam and an interview. The term mark depends on the participation of the students during the semester.

Registration for the course: An application in the academic department or the department.

Registration for the Exam: Coordinated with the lecturer and academic department.

References:

1. Yablonskiy SV, Functional constructs in k-valued logic. Work mat. of their institute. VA Steklov, on 51, 1958, 5-142.
2. Chimev, K., Functions and graphs. Blagoevgrad, 1984, 1-199.
3. Chimev, K., I. Gyudzhenov. Subfunctions and power of some classes of functions. Blagoevgrad, 1991, 1-220.
4. Chimev, K., Discrete functions and sub-functions, Blagoevgrad, 1991, 1-258.
5. Chimev, K., Iv. Mirchev. Separable and dominating sets of variables, Blagoevgrad, 1993, 1-131.
6. Shtrakov, S. Dominating and annuling sets of variables for the functions. Blagoevgrad, 1987, 1-180.
7. Yamnenko R.Є. Discrete Mathematics, 2010, ISBN 978-966- 529-232- 6
1. http://probability.univ.kiev.ua/userfiles/yamnenko/manual_DM.pdf
8. S. Toleva-Stoimenova, Discrete Mathematics 2010/2011; http://ibz2010.hit.bg/DM/dm_ex_t1_sets.pdf

Abbreviation:

FS: Fall Semester

SS: Spring Semester

SPECIAL MATRICES

Semester: 3 semester

Course Type: lectures and tutorials

Hours per week/FS/SS: 2 lecture hours, 1 tutorial hour per week / FS

ECTS credits: 4,5 credits

Department: Department of Mathematics, Faculty of Mathematics and Natural Sciences, South-West University "Neofit Rilski" – Blagoevgrad.

Course Status: Electively course in the B.S. Curriculum of ICT.

Short Description: The elective course in Special Matrices has the objective to make the students familiar: with the basic sort of matrices, which have place in different fields of Mathematics and their applications; with methods for its reduce to a canonical form; with some undecided problems in the fields of the matrices like Hadamard Matrices. The course extends and expands the student's knowledge, which they have from course in Linear Algebra. A great part of this material is an introduction into mathematical specialty at the Universities, which make efforts to use modern methods for research with the help of Mathematics and Computer Sciences. The lecture course shows the current status of this material. This course is built, basing on the notation of "vector space".

Course Aims: Students should obtain knowledge and skills for basic concepts under consideration. They should successfully use the methods for its calculation.

Teaching Methods: lectures and tutorials

Requirements/Prerequisites: Linear Algebra.

Assessment: written final exam

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

Registration for the Exam: coordinated with the lecturer and Students Service Department

References:

Basic Titles:

1. A. Borisov, Il. Guidzhenov, Il. Dimitrova. Linear Algebra, University Press, South-West University "Neofit Rilski", Blagoevgrad, 2009 /in Bulgarian/.
2. Genov, G., S. Mihovski, T. Mollov. Algebra, University Press „Paisii Hilendarski", Plovdiv, 2006 /in Bulgarian/.
3. Kl. Denecke, K. Todorov, Linear Algebra, Blagoevgrad 1992 /in Bulgarian/.
4. K. Dochev, D. Dimitrov, Linear Algebra, "Science and Art", Sofia, 1973 /in Bulgarian/.

Additional Titles:

1. Пароди, М., Локализация характеристических чисеч матриц, Москва, 1960 /in Russian/
2. Hedayat, A., W. D. Wallis, Hadamard Matrices and their applications, Annals of Statistics, 6(1978), No 6, 1184-1238
3. Malcev, A. I., Fundamentals of Linear Algebra, Moscow, 1970 /in Russian/.

Abbreviation:

FS: Fall Semester
SS: Spring Semester

DEVELOPMENT OF OBJECT-ORIENTED APPLICATIONS WITH DESIGN PATTERNS

Semester: 3th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 1 lab per week / WS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: During the course students will become familiar with different types of design patterns and opportunities for code reuse in development of object-oriented applications. Following classical taxonomy regarded as object-oriented patterns (GoF design patterns), and architectural patterns will be observed. GoF patterns are grouped into three main groups - building, structural and behavioral. The course addresses some of the so-called. anti-patterns. For each one of them a rigorous analysis of its weaknesses will be performed.

Course Objectives: The course aims to broaden the usual preparation of programmers with specialized training in the application of design patterns.

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

Requirements/Prerequisites: Needed basic knowledge of operating systems, programming, computer architectures, computer networks and communications.

Assessment: written final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

References:

1. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 1994
2. Eddie Burris, Programming in the Large with Design Patterns, Pretty Print Press, 2012
3. Tony Bevis, C# Design Pattern Essentials, Ability First Limited, 2012
4. Martin Fowler, Patterns of Enterprise Application Architecture, Addison-Wesley, 2003
5. Cay Horstmann, Object-Oriented Design and Patterns, Wiley, 2006
6. Eric Freeman, Bert Bates, Kathy Sierra and Elisabeth Robson, Head First Design Patterns, O'Reilly, 2004
7. Tony Bevis, Java Design Pattern Essentials - Second Edition, Ability First Limited, 2012

INTRODUCTION TO XML

Semester: 3 semester

Course Type: lectures and laboratory exercises

Hours per week FS/SS: 1 lecture hour and 2 laboratory hours per week /FS

ECTS credits: 4.5 credits

Department: Department of Informatics

Course Status: Optional Course in the Information System and Technologies B. S. Curriculum

Course Description: The course includes basics of the language XML and includes topics: introduction to the language XML, advantages of presenting data through XML; well-formed XML documents; use of namespaces in XML; validation of XML documents using DTD; validation of XML documents through schemes; create XML schemas; XML languages schemes Relax NG and Schematron; extracting data from XML documents, use DOM; view language xPath; getting to know the language XSLT, key elements; reuse of code in XSLT, built-In templates and rules; getting to know the language xQuery; additional features of the language xQuery; XML and databases; employment opportunities for the management of databases with XML.

Course Objectives: Students should obtain fundamental knowledge and skills related to the basics of the language XML and related technologies.

Teaching Methods: lectures and laboratory exercises

Requirements/Prerequisites: Basic knowledge and skills for information systems and technology.

Assessment: written final exam

Registration for the Course: by request at the end of the previous academic year

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

References:

1. Joe Fawcett, Liam R.E. Quin, Danny Ayers. Beginning XML, Fifth Edition. John Wiley & Sons, Inc. 2012.
2. Elliotte Rusty Harold. XML 1.1 Bible, 3rd Edition. Wiley Publishing, Inc. 2004.
3. Dorothy J. Hoskins. XML and InDesign, First Edition. O'Reilly Media, Inc. 2013.
4. Aaron Skonnard, Martin Gudgin. Essential XML Quick Reference: a Programmer's Reference to XML, XPath, XSLT, XML Schema, SOAP, and More. Pearson Education, Inc. 2002.
5. Doug Tidwell. XSLT, Second Edition. O'Reilly Media, Inc. 2008.
6. Priscilla Walmsley. XQuery, First Edition. Priscilla Walmsley. 2007.

Abbreviation:

FS: Fall Semester

SS: Spring Semester

MODERN LANGUAGES AND PROGRAMMING ENVIRONMENTS

Semester: 3th semester

Course Type: seminars and labs

Hours (weekly)/WS/SS: 1 seminar and 2 labs per week / WS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Systems and Technologies Bachelor Curriculum.

Course Description: The course introduces students to some of the most used modern languages for object-oriented programming, as well as the most commonly used modern environments for visual design and event-oriented programming. The aim of the course is to acquaint students with the basic principles of application development with modern programming languages and the principles of organization of the most popular development environments. The most important practical topics covered are related to basic software development tools, version control, basic language tools and libraries that are available and distributed with the relevant environments. The course looks at the capabilities of some of the modern programming languages, discussing approaches focused on object-oriented programming, including. inheritance and polymorphism, creation of event-oriented applications and other basic capabilities.

Course Aims: The aim of the course is to familiarize students with the principles of application development with modern programming languages and principles of the organization of the most popular development environments.

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

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

Assessment: Written final exam

Registration for the Course: Coordinated with the lecturer and Student Service Department

References:

1. C++Builder Developer's Guide (2020). Retrieved from: docwiki.embarcadero.com/RADStudio/Rio/en/C%2B%2BBuilder_Developer%27s_Guide.
2. Windows Developer's Guide (2020). Retrieved from: docwiki.embarcadero.com/RADStudio/Rio/en/Windows_Developer%27s_Guide_Index
3. Marc Gregoire, Van Weert Peter. C++17 Standard Library Quick Reference, 2nd Edition. A Pocket Guide to Data Structures, Algorithms, and Functions. Apress, 2019.
4. Mike McGrath. C++ Programming in easy steps, 5th Edition. Easy Steps Limited, 2017.
5. Ray Lischner. Exploring C++. The Programmer's Introduction to C++. Apress, 2008.
6. Marc Gregoire, Peter Van Weert. C++ Standard Library Quick Reference. Apress, 2016.
7. Bjarne Stroustrup. The C++ Programming Language, 4th Edition. Pearson Education, Inc., 2013.
8. David M. Mount, Michael T. Goodrich, Roberto Tamassia. Data Structures and Algorithms in C++, 2nd Edition. John Wiley & Sons, Inc., 2011.
9. Component Writer's Guide (2020). Retrieved from: docwiki.embarcadero.com/RADStudio/Rio/en/Component_Writer%27s_Guide_Index.

Abbreviation:

FS: Fall Semester
SS: Spring Semester

CODING THEORY AND COMBINATORICS

Semester: Fourth semester

Form of the course: Lectures/exercises

Hours (per week): 2hours lectures + 2hours exercises per week, summer semester

Credits: 6 credits

Department: Informatics, Faculty of Mathematics and Natural Sciences, Southwestern University "Neofit Rilsky" – Blagoevgrad

Course Status: compulsory course

Course Description: The course starts with introduction of the main notions of the Coding theory – error-correcting codes, Hamming distance, code parameters and equivalency of codes. Then the necessary algebraic background (finite fields and vector spaces over finite fields) is developed and encoding and decoding with linear codes (including syndrome decoding) are studied. Important classes of codes are introduced, and the theory of cyclic codes is developed. In the cryptographic part the classical ciphers are considered and followed by the modern systems for secret and public keys.

Course Objectives Obtaining knowledge of the theoretical backgrounds and practical abilities for applications of the Coding theory and the cryptography. Development of abilities for work with (linear) codes over finite field with special emphasis of their algebraic and combinatorial properties.

Teaching Methods: lectures, discussions, practical exercises of the codes under consideration

Requirements: The students must have basic knowledge from the Number theory and algebra.

Assessment: Permanent control during the semester (two written exams) and exam in the semester's end in two parts – problems solving and answering theoretical questions.

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

Registration for the Exam: up to agreement with the teacher and the Educational Office.

References:

1. R. Hill. A first course in coding theory, Calderon Press, Oxford, 1986.
2. F. J. MacWilliams, N. J. A. Sloane, The theory of error-correcting codes, New York, North Holland, 1977 (руски превод Москва, Связь, 1979).
3. W. Peterson, E. Weldon Jr., Error-correcting codes, Second edition, Cambridge (Mass), MIT Press, 1971 (руски превод Москва, Мир, 1976).
4. Р. Блейхут. Теория и практика кодов, контролирующих ошибки, Москва, Мир, 1986.
5. Hankerson et al, Coding theory and Cryptography, the essentials (2nd edn.), Chapman & Hall/CRC Pure and Applied Mathematics, 2000.
6. Записки (www.moi.math.bas.bg/~peter).

Abbreviation:

FS: Fall Semester
SS: Spring Semester

ALGORITHMS IN GRAPHS AND NETWORK

Semester: 4 semester

Course type: Lectures

Hours (weekly) / SS /: lectures - 3 hours per week + seminars – 1 hour per week

Number of ECTS credits: 6.0

Department: Informatics

Type of the course in the curriculum: Compulsory course from the curriculum of the "Information Systems and Technology" Bachelor's degree program

Course description: In this course are considered some elements of the following main topics: introduction in graph theory (essential concepts and definitions. modeling with graphs and networks, data structures for networks and graphs; computational complexity; heuristics; tree algorithms (spanning tree algorithms. variations of the minimum spanning tree problem. branching and arborescence); shortest-path algorithms (types of shortest-path problems and algorithms, shortest- paths from a single source, all shortest-path algorithms, the k- shortest-path algorithm, other shortest paths).

Goal: Students should obtain basic knowledge and skills for solving optimization problems for graphs and networks.

Teaching methods: lectures, demonstrations, problem solving

Prerequisites: Mathematics, Informatics

Examination and assessment procedures: The estimation of the acquired knowledge is based on a written exam which consists of problem solving and theoretical knowledge examination (writing on a topic from the syllabus provided to students)

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

Registration for examination: coordinated with the lecturer and the academic affairs department

References:

1. Ив.Мирчев, "Графи. Оптимизационни алгоритми в мрежи", Благоевград, 2001 г.
2. Ив.Мирчев, "Математическо оптимиране", Благоевград, 2000 г.
3. Minieka, E., Optimization Algorithms for Networks and Graphs, Marcel Dekker, Inc., New York and Basel, 1978 (Майника, 3. Алгоритми оптимизации па сетях и графах, М., "Мир", 1981).
4. Keijo Ruohonen. GRAPH THEORY. math.tut.fi/~ruohonen/GT_English.pdf
5. Boris Goldengorin. (2018). Optimization Problems in Graph Theory, In Honor of Gregory Z. Gutin's 60th Birthday Springer International Publishing AG
6. Ronald Gould. Graph Theory (Dover Books on Mathematics. 2012. US Cafifornia.
7. Lih-Hsing Hsu , Cheng-Kuan Lin, Graph Theory and Interconnection Networks. 1420044818;
8. Team DDU.Christofides, N., Graph Theory. An Algorithmic approach, Academic Press lnc (London) Ltd. 1975, 1977 (Крисгофидес, И. Теория графов. Алгоритмический подход, М., "Мир", 1978).

9. Swamy, M., K. Thulasirman, Graphs, Networks and Algorithms, John Wiley & Sons, 1981 (Сваами М., К. Тхуласирман. Графм, сети и алгоритми, М., "Мир", 1984).

MATHEMATICAL OPTIMIZATION

Semester: 4 semester

Course Type: lectures and tutorials

Hours per week/FS/SS: 2 lecture hours and 2 tutorial hours per week/SS

ECTS credits: 6 credits

Department: Department of Informatics

Course Status: Compulsory course in the Information Systems and Technologies B.S. Curriculum

Short Description: The course in Optimization (Mathematical Programming) includes basic results and methods for solving various types optimization problems and related topics: nonlinear optimization problems, linear optimization problems (simplex method, duality in linear optimization, transportation problem, assignment problem), matrix games (John von Neumann minimax theorem, graphical method for solving 2 x 2, 2 x *n,* and *m* x 2 games, relation between matrix games and linear optimization), convex analysis (convex sets, sum of sets and product of a set with a real number, projection of a point onto a set, separation of convex sets, extreme points, cones, polar cones, polyhedrons, convex functions, directional derivatives, subgradients and subdifferentials), convex optimization problems (Kuhn-Tucker theorem), quadratic optimization problems.

Course Aims: Students should obtain basic knowledge and skills for solving optimization problems under consideration.

Teaching Methods: lectures and tutorials

Requirements/Prerequisites: Mathematical Analysis, Linear Algebra, Analytic Geometry.

Assessment: written final exam

Registration for the Course: not necessary

Registration for the Exam: coordinated with the lecturer and Students Service Department

References:

Basic Titles:

1. P. Kenderov, G. Hristov, A. Dontchev – "Mathematical Optimization", Kliment Ohridski Sofia University Press, Sofia, 1989 (in Bulgarian).
2. "Mathematical Optimization Problem Book and Handbook", Kliment Ohridski Sofia University Press, Sofia, 1989 (in Bulgarian).

3. M. Slavkova – "Mathematical Optimization Methods", Sofia, 2000 (in Bulgarian).
4. M. Slavkova, Z. Tsenova – "Quantitative Methods and Statistics Problem Book", Technical University, Sofia, 2011 (in Bulgarian).
5. S. M. Stefanov – "Quantitative Methods of Management", 2003 (in Bulgarian).

Additional Titles:

1. Suresh Chandra, Jayadeva Aparna Mehra – "Numerical Optimization with Applications", Narosa Publishing House, New Delhi, 2013.
2. Andrew R. Conn, Katya Scheinberg, Luis N. Vicente – "Introduction to Derivative-Free Optimization", SIAM, Philadelphia, PA, USA, 2009.
3. Griva, S. G. Nash. A. Sofer – "Linear and Nonlinear Optimization", 2-nd. ed., SIAM, Philadelphia, 2009.
4. S. M. Stefanov – "Separable Programming. Theory and Methods", 4-th ed., Springer, Dordrecht-Boston-London, 2016.
5. Hamdy A. Taha – „Operations Research. An Introduction", 10-th ed., Pearson, USA, 2017.
6. William F. Trench – "The Method of Lagrange Multipliers", Trinity University, San Antonio, Texas, USA, 2013 (also available online).

Abbreviation:

FS: Fall Semester
SS: Spring Semester

DATA ANALYSIS WITH MS EXCEL AND VBA

Semester: 4 semester

Type of Course: lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 1 hours tutorials in computer lab/ spring semester.

Department: Informatics

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

Course description: The course is an introduction to data analysis with MS Excel and VBA.

Objectives: The student should obtain knowledge of:

- Design and implementation of VBA applications.
- Design and implementation data analysis using MS Excel and VBA.

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

Pre- requirements: Database systems (core 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: by request at the end of the current semester

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

References:

Basic

1. Пол Макфедрис, Excel 2016 Формули и функции, ЗеСТ Прес, 2017
2. J. Parsons, D. Oja, R. Ageloff, P. Carey, New Perspectives on Microsoft Excel 2016, Comprehensive, Course Technology Cengage Learning, 2016

Additional

1. Walkenbach, John, Excel® 2013 Power Programming with VBA, John Wiley & Sons, Inc, 2013
2. https://www.guru99.com/creating-your-first-visual-basic-for-applications-vba-in-excel.html (2020)

On-line resources

1. URL http://www.e-learning.swu.bg

PROGRAMMING WITH .NET FRAMEWORK

Semester: 4th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 1 lecture and 2 labs per week / SS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: This course observes .NET software development framework. The main topics included in this course are: .Net Framework overall architecture, CLR, CTS, lambda expressions, data access – EF/LINQ, processing XML, WinForms. Will be addressed and some of the more complex concepts such as reflection, asynchronous programming.

Course Aims: The course aim is to give theoretical and practical background to students to use .NET family languages in custom software development.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming with C++/Java, Operating Systems.

Exam: final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Светлин Наков и Веселин Колев, Въведение в програмирането със C#, Фабер, 2011, ISBN: 978-954-400-527-6
2. Eric Gunnerson and Nick Wienholt, A programmer's Guide to C# 5.0, APress, 2012
3. Daniel Solis, Illustrated C# 2012, 2nd.Edition. APress, 2012
4. Thuan Thai and Hoang Lam, .NET Framework Essentials, 2nd Edition, O`Reilly, 2002, ISBN 0-596-00302-1
5. Jeff Prosise, Programming Microsoft .NET (core reference), Microsoft Press, 2002, ISBN 0-7356-1376-1
6. Jesse Liberty, Programming C#, 2nd Edition, O`Reilly, 2001, ISBN 0-596-00117-7
7. Fergal Grimes, Microsoft .NET for Programmers, Manning Publications, 2002, ISBN 1-930110-19-7
8. Jesse Liberty, Programming C#, 2nd Edition, O'Reilly & Associates, Inc., 2002, 648 pages, ISBN: 0596003099
9. Microsoft Developers Network. https://msdn.microsoft.com/bg-bg

GRAPH THEORY

Semester: 4 semester

Course type: Lectures

Hours (weekly) /SS/: lectures - 2 hours per week + seminars – 1 hour per week

Number of ECTS credits: 4.5

Department: Informatics

Type of the course in the curriculum: Compulsory course from the elective course of the "Information Systems and Technology" Bachelor's degree program

Course description: The 1970s ushered in an exciting era of research and applications of networks and graphs in operations research, industrial engineering, and related disciplines. Graphs are met with everywhere under different names: "structures", "road maps" in civil engineering; "networks" in electrical engineering; "sociograms", "communication structures" and

"organizational structures" in sociology and economics; "molecular structure" in chemistry; gas or electricity "distribution networks" and so on.

Because of its wide applicability, the study of graph theory has been expanding at a very rapid rate during recent years; a major factor in this growth being the development of large and fast computing machines. The direct and detailed representation of practical systems, such as distribution or telecommunication networks, leads to graphs of large size whose successful analysis depends as much on the existence of "good" algorithms as on the availability of fast computers. In view of this, the present course concentrates on the development and exposition of algorithms for the analysis of graphs, although frequent mention of application areas is made in order to keep the text as closely related to practical problem-solving as possible.

Although, in general, algorithmic efficiency is considered of prime importance, the present course is not meant to be a course of efficient algorithms. Often a method is discussed because of its close relation to (or derivation from) previously introduced concepts. The overriding consideration is to leave the student with as coherent a body of knowledge with regard to graph analysis algorithms, as possible.

In this course are considered some elements of the following main topics.

- Introduction in graph theory (essential concepts and definitions, modeling with graphs and networks, data structures for networks and graphs, computational complexity, heuristics).
- Tree algorithms (spanning tree algorithms, variations of the minimum spanning tree problem, branchings and arborescences).
- Shortest-path algorithms (types of shortest-path problems and algorithms, shortest-paths from a single source, all shortest-path algorithms, the k- shortest-path algorithm, other shortest-paths).
- Maximum- flow algorithms (flow-augmenting paths, maximum-flow algorithm, extensions and modifications, minimum-cost flow algorithms, dynamic flow algorithms).
- Matching and assignment algorithms (introduction and examples, maximum-cardinality matching in a bipartite graph, maximum-cardinality matching in a general graph, maximum-weight matching in a bipartite graph, the assignment problem).
- The chinest postman and related arc routing problems (Euler tours and Hamiltonian tours, the postman problem for undirected graphs, the postman problem for directed graphs).
- The traveling salesman and related vertex routing problems (Hamiltonian tours, basic properties of the traveling salesman problem, lower bounds, optimal solution techniques, heuristic algorithms for the TSP).
- Location problems (classifying location problems, center problems, median problems).
- Project networks (constructing project networks, critical path method, generalized project networks).

Goal: Students should obtain basic knowledge and skills for solving optimization problems for graphs and networks.

Teaching methods: lectures, demonstrations, problem solving

Prerequisites: Mathematics, Informatics

Examination and assessment procedures: The estimation of the acquired knowledge is based on a written exam which consists of problem solving and theoretical knowledge examination (writing on a topic from the syllabus provided to students)

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester.

Registration for examination: coordinated with the lecturer and the academic affairs department.

References:

Basic

1. Ив.Мирчев, "Графи. Оптимизационни алгоритми в мрежи", Благоевград, 2001 г.
2. Ив.Мирчев, "Математическо оптимиране", Благоевград, 2000 г.
3. Minieka, E., Optimization Algorithms for Networks and Graphs, Marcel Dekker, Inc., New York and Basel, 1978 (Майника, 3. Алгоритми оптимизации па сетях и графах, М., Мир", 1981).

Additional

1. Keijo Ruohonen. GRAPH THEORY. math.tut.fi/~ruohonen/GT_English.pdf
2. A book on algorithmic graph theory: https://code.google.com/p/graph-theory-algorithms-book/
3. Ronald Gould. Graph Theory (Dover Books on Mathematics. 2012. US Cafifornia.
4. Lih-Hsing Hsu , Cheng-Kuan Lin, Graph Theory and Interconnection Networks. 1420044818;
5. Team DDU.Christofides, N., Graph Theory. An Algorithmic approach, Academic Press lnc (London) Ltd. 1975, 1977 (Крисгофидес, И. Теория графов. Алгоритмический подход, М., "Мир", 1978).
6. Swamy, M., K. Thulasirman, Graphs, Networks and Algorithms, John Wiley & Sons, 1981 (Сваами М., К. Тхуласирман. Графм, сети и алгоритми, М., "Мир", 1984).

Notes:

SS: Spring semester

INTRODUCTION IN LATEX 2E

Semester: 3-rd semester

Course type: Lectures/Seminars

ECTS Credits: 4,5 credits

Department: Computer science

Course status: Selective Course in the Information systems end technology B.S. Curriculum

Course description: The Course is an Introduction in LATEX 2e used as a word processor when preparing text in mathematical, computer and other sciences.

Course aims: Non-trivial introduction in some important for Mathematicians and Computer scientists system for writing text with high quality.

Teaching methods: lectures, group discussions or workshop, projects, other methods

Requirements/ Prerequisites: Basic knowledge in Mathematics and Programming.

Materials: Textbook and manual of the course are published; access to web sites via Internet.

Evaluation: Written examination 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: in the department office, coordinated with the lecturer.

GRAPHIC DESIGN OF PRINTED AND PROMOTIONAL MATERIALS

Semester: 4th semester

Course Type: seminars and lab exercises

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

ECTS credits: 4.5 credits

Department: Informatics

Course Status: Optional Course in the Information Systems and Technologies, Bachelor of Science Curriculum of Informatics

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. Rebecca Gagen, Kim Golombisky (2010) White Space is Not Your Enemy: A Beginner's Guide to Communicating Visually through Graphic, Web and Multimedia Design, Focal Press.
2. John McWade (2005) Before & after graphics for Business, Peachpit Press.
3. Roger C. Parker (2006) Design to Sell: Use Microsoft® Publisher to Plan, Write and Design Great Marketing Pieces, Microsoft Press.
4. Brian P. Lawler (2005) Official Adobe Print Publishing Guide, Second Edition: The Essential Resource for Design, Production, and Prepress, Adobe Press.
5. Elizabeth Eisner Reding (2013) Microsoft Publisher 2013: Illustrated, Cengage Learning Publishing
6. Joy L. Starks (2014) Microsoft Publisher 2013: Complete, Cengage Learning Publishing
7. Tamara Weinberg (2009) The new community rules. Marketing on the social web, O'Reilly Media
8. John DiMarco (2010) Digital Design for Print and Web. An Introduction to Theory, Principles, and Techniques, Wiley Publishing
9. Wayne Collins, Alex Hass, Ken Jeffery, Alan Martin, Roberto Medeiros, Steve Tomljanovic (2018) Graphic Design and Print Production Fundamentals; https://openlibrary-

repo.ecampusontario.ca/jspui/bitstream/123456789/252/1/Graphic-Design-and-Print-Production-Fundamentals-1447356112.pdf
10. *SCRIBUS: Open-Source Desktop Publishing*, http://www.scribus.net/canvas/Scribus, 2012
11. *GIMP: GNU Image Manipulation Program*, http://www.gimp.org/, 2012
12. *INSCAPE: Open Source Scalable Vector Graphics Editor*, http://inkscape.org/, 2012

Abbreviation:

SS: Spring Semester

PROGRAMMING WITH RUBY

Semester: 4th semester

Course Type: seminars and lab exercises

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

ECTS credits: 4.5 credits

Department: Informatics

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

Course Description: The course is a practical introduction to scripting object-oriented programming language Ruby with open source. It combines parts of other programming language such as Perl, Smaltalk, Eiffle, Ada and Lisp. Ruby is the bases framework Ruby on Rails, which is one of modern languages to develop web applications. The course will examine various implementations of Ruby, as IronRuby, Ruby on Rails, RubyMine. Ruby is considered flexible because the language that programmers can freely modify any part of its code.

Course Objectives: This course aims to provide students with knowledge and additional training in the theory and practice of programming language Ruby. Will be discussed at the method of operating with numeric types, arrays, proc, functions, and classes and metaprogramming. During the seminars will be discussed many examples.

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

Requirements: Needed basic knowledge of introduction to programming and web systems and technologies.

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, paper and the average grade of the tasks solved during the laboratory sessions. 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. Huw Collingbourne (2011) *The book of Ruby. A Hands-on guide for the adventurous*, No starch Press, San Francisco
2. Paolo Perrotta (2014) *Metaprogramming Ruby*, 2nd Edition, O'Reilly
3. Gregory T. Brown (2009) *Ruby Best Practices*, O'Reilly
4. Adam Gamble, Cloves Carneiro Jr., Rida Al Barazi (2013) *Beginning Rails 4*, Third Edition, Apress
5. David Copeland (2013) *Build awesome command-line applications in Ruby 2. Control your computer, simplify your life*, The Pragmatic Bookshelf, USA
6. Sandi Metz (2013) *Practical object-oriented design in Ruby*, Addison-Wesley Press, USA
7. Ophir Frieder, Gideon Frieder, David Grossman (2013) *Computer science programming basics with Ruby*, O'Reilly Publishing
8. Carleton DiLeo (2019) *Clean Ruby: A Guide to Crafting Better Code for Rubyists*, Apress.
9. David A. Black, Leo Joseph (2019) *The Well-Grounded Rubyist*, 3rd Edition, MANNING Shelter Island Press.
10. Jay Gods (2018) *Ruby Data Processing: Using Map, Reduce, and Select*, Apress.
11. Bala Paranj (2017) *Test Driven Development in Ruby. A Practical Introduction to TDD Using Problem and Solution Domain Analysis*, Apress.
12. Malay Mandal (2017) *Ruby Recipes. A Problem-Solution Approach*, Apress.
13. Peter Cooper (2016) *Beginning Ruby*, 3rd Edition, Apress.
14. Alexander Dymo (2015) *Ruby Performance Optimization. Why Ruby is Slow, and How to Fix It*, The Pragmatic Programmers, LLC.
15. Stefan Wintermeyer (2018) *Learn Rails 5.2: Accelerated Web Development with Ruby on Rails*, Apress.
16. John S. Conery (2011) *Explorations in Computing. An Introduction to Computer Science*, CRC Press.
17. Paolo Perrotta (2014) *Metaprogramming Ruby 2. Program Like the Ruby Pros*, The Pragmatic Programmers, LLC.

Abbreviation:

SS: Spring Semester

PATTERN RECOGNITION

Semester: 4 semester

Form of the course: lectures/exercises

Hours (per week): 1 lecture hours + 1 lab exercises per week, Spring semester

Credits: 3 credits

Department: Informatics

Status of the course in the educational plan: Optional course in the Information Systems and Technologies B.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). This course is in compliance with similar courses in US and Russia.

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, seminars, discussions, practical work, homework.

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: Course project and final exam.

Registration for the course: Students make a request at the end of the current semester.

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

References:

1. Синягина Нина, Маргарита Тодорова, РАЗПОЗНАВАНЕ НА ОБРАЗИ, Универ-ситетско издателство „Неофит Рилски", Благоевград, 2007
2. Aitken C., F. Taroni,Statistics and the Evaluation of Evidence for Forensic Scientists , Wiley, 2004.
3. Bishop C.Pattern Recognition and Machine Learning , Springer 2006,
4. Duda R. O, P. E. Hart, D. Stork Pattern Classification (2nd. Edition) , Wiley 2002,
5. Fu K. Syntacic (Linnguistic) Pattern Recognition.- to book "Digital Pattern Recognition", Edited by K. Fu, Second Corrected and Updated Edition, Springer - Verlag: Berlin-Heidelberg - New York,1980

6. Kuncheva Ludmila, Combining Pattern Classifiers: Methods and Algorithms, Wiley, 2004
7. Looney C.G., Pattern Recognition using neural networks: theory and algorithms for engineers, Oxford University Press, 1997

MATHEMATICAL MODELS IN ECONOMICS

Semester: 4 semester

Course Type: lecture

Hours per week/FS/SS: 2 lecture / SS

ECTS credits: 3

Department: Department of Computer Science

Course Status: Optional course in the Information systems and technologies

Course Description: Mathematical models in economics are a new topic in mathematics. In this course, we present some element of the optimization theory, discrete optimization and probability theory.

Course Aims: Students should obtain knowledge and skills for matroid theory.

Teaching Methods: lectures, demonstrations and work on project

Requirements/Prerequisites: Linear algebra.

Assessment: course project

Registration for the Course: By request at the end of the current semester

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

References:

Basic Titles:

1. D. J. A. Welsh. Matroid Theory. Acad. Press. New York. 1976
2. Николас Уирт. Алгоритми + структури от данни = програми. СофтПрес, София, 1996.
3. Аласдър Смит. Математическо въведение в икономиката. Изд. „Кл. Охридски" 2000.
4. Кендеров П., Христов Г., Дончев А., Математическо оптимиране. София, Изд. "Климент Охридски" 1989.
5. Ковалев М.М., Дискритна оптимизация, Минск 1977 г. Издателство БГУ.
6. Вейль. Г. Элементарная теория выпуклых многогранников. В кн. Матричые игры. М: Физматгиз, 1966.

Abbreviation:

SS: Spring Semester

MATROID THEORY

Semester: 4 semester

Course Type: lecture

Hours per week/FS/SS: 2 lecture week/ SS

ECTS credits: 3

Department: Department of Computer Science

Course Status: Optional course in the Information systems and technologies

Course Description: Matroid theory is a new topic in mathematics. In this course, we present some element of the matroid terminology.

Course Aims: Students should obtain knowledge and skills for matroid theory.

Teaching Methods: lectures, demonstrations and work on project

Requirements/Prerequisites: Linear algebra.

Assessment: course project

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

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

References:

Basic Titles:

1. D. J. A. Welsh. Matroid Theory. Acad. Press. New York. 1976

Abbreviation:

FS: Fall Semester
SS: Spring Semester

SEPARABLE SETS OF VARIABLES

Semester: 4th semester

Course Type: seminars and lab exercises

Hours per week/SS: 2 lectures hours per week / SS

ECTS credits: 3.0 credits

Department: Informatics, telephone: 073 / 8889132

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

Course Description: The course covers sections associated with separable sets of variables functions. Particular attention is paid to strongly essential and s-strongly essential variables of functions. The behavior of the functions of operations, replacement of variables and constants identification of variables is examined. Graphs of functions are studied in terms of their separable pairs of variables.

Goals, objectives and expected results The objective and main task of the studied subject is to acquaint students with the basic concepts and theorems related to separable sets of variables of functions.
The expected result is students to be able to apply theoretical knowledge in theory and graph functions in terms of their separable pairs of arguments.

Teaching methods: In the lecture hours key issues are discussed. The discussions are detailed in the hours for exercise. In these classes students report their results of doing independent work.

Prerequisites: Knowledge of mathematical logic.

Evaluation: Paper or written exam and an interview. The term mark depends on the participation of students during the semester.

Registration for the Course: An application in the academic department or the department.

Registration for the Exam: Coordinated with the lecturer and academic department.

References:

A. Main

1. Chimev K. N. Separable sets of arguments of functions, Blagoevgrad, 1982, 1-206.
2. Chimev K. N., Functions and graphs. Blagoevgrad, 1983, 1-195.
3. Chimev K Separable sets of variables of functions, Blagoevgrad, 2005.

B. Additional

1. Chimev, K., Separable Sets of Arguments of Function, MTA Sz TAKI, Budapest, 180, 1986, 1-173
2. Chimev, K., Aslanski, Structural charakteristices of one class of Bolean Functions, Koezlemenyck, 31, 1984, 23-31.
3. Chimev K. N., Acting Gyudzhenov. Sub-headings and power of some classes of functions, Blagoevgrad, 1987, 1-220.
4. Shtrakov, Sl. Vl., Dominating and Annuling Sets of Variables for the functions, Blagoevgrad, 1987, 1-180.
5. Chimev K.N., Iv. Mirchev, Separable and Dominating Sets of Variables, Blagoevgrad, 1993, 1-131.
6. Shtrakov Sl. and Denecke K., Essential Variables and Separable Sets in Universal Algebra, 2008
7. Shtrakov Sl and Koppitz J., Finite symmetric functions with non-trivial arity gap, Serdica J. Computing 6 (2012) 419-436.

Abbreviation:

SS: Spring Semester

LANGUAGE CULTURE

Semester: 4th semester

Course Type: seminars exercises

Hours per week/SS: 2 lectures hours per week / SS

ECTS credits: 3.0 credits

Department: Informatics

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

DECRIPTION OF THE COURSES AT THE THIRD YEAR

ANALYSIS AND SYNTHESIS OF ALGORITHMS

Semester: 5th semester

Course Type: lectures and exercises

Hours per week/FS/SS: 2 lectures; 2 exercise week/FS

ECTS credits: 6.0 credits

Department: Department of Computer Science

Course Status: Compulsory course

Course Description: This course covers the essential information that every serious programmer needs to know about algorithms and data structures, with emphasis on applications and scientific performance analysis. An introduction to fundamental data types, algorithms, and data structures, with emphasis on applications and scientific performance analysis of algorithms.

Teaching Methods: lectures.

Requirements/Prerequisites: Knowledge in Mathematics.

Exam: final exam

Registration for the course: no

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

References:

Basic

1. Cormen, Thomas H.; Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford (2009). Introduction to Algorithms (3rd ed.). MIT Press and McGraw-Hill.
2. Umut A. Acar, Guy E. Blelloch. (2018). Algorithms - Parallel and Sequential, www.parallel-algorithms-book.com.
3. П. Наков, П. Добриков. Програмиране = ++ Алгоритми. ТорТеам Со, София, 1999

Additional

1. Introduction to Algorithms http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/lecture-videos/ 2015 MIT
2. Design and Analysis of Computer Algorithms https://www.cs.umd.edu/~mount/451/Lects/451lects.pdf 2015

Abbreviation:

FS: Fall Semester

COMPUTER SECURITY

Course Title: Computer Security

Semester: 5th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 1 lab per week / WS

ECTS Credits: 6.0 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Systems and Technologies Bachelor Curriculum.

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, computer networks and communications.

Assessment: written final exam

Registration for the Course: the course is compulsory

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. Cybercrime Exposed, McAfee White paper (http://www.mcafee.com/us/resources/white-papers/wp-cybercrime-exposed.pdf)
4. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов, Защита на компютърната информация, УИ „Неофит Рилски", 2005

5. 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)
6. 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)
7. Ronald L. Krutz, Russell Dean Vines, Cloud Security. A comprehensive guide to secure cloud computing, Wiley, 2010
8. Христо Тужаров, 2010, Архитектура на информационната сигурност, Асеневци
9. Сайт на Националният Център за Действие при Инциденти в Информационната Сигурност (https://govcert.bg/)

THEORETICAL FOUNDATIONS OF INFORMATICS

Semester: 5 semester

Course type: lectures

Hours (weekly) / FS / SS: lectures – 2 hours per week + seminars – 1 hour per week/ FS

Number of ECTS credits: 6.0

Department: Informatics

Type of the course in the curriculum: Compulsory course from the curriculum of the "Information Systems and Technologies" Bachelor's degree program

Course description: It deals with the theory of algorithms.

Goal: The course in Theoretical foundations of informatics aims to introduce students to the basic concepts and results of the theory of algorithms.

Teaching methods: lectures, demonstrations, problem solving

Prerequisites: The acquired knowledge is useful in theory of algorithms.

Examination and assessment procedures: The estimation of the acquired knowledge is based on a written exam which consists of problem solving and theoretical knowledge examination (writing on a topic from the syllabus provided to students)
The final grade includes the assessment of the students' progress throughout a course of study (30 %) plus the examination at the end of it (70 %)

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

Registration for examination: coordinated with the lecturer and the academic affairs department

References:

Basic

1. Математическа теория на информатиката, Зоар Манна, "Наука и изкуство», София 1983.
2. Вычислимость введение в теорию рекурсивнмх функний, Н. Катленд, "Мир", Москва 1983.
3. Енциклопедия по математической логике, Барвайз, "Мир", Москва 1981

Additional

1. A concept of logic, Seventh edition. Hurley, Springer, 2009, http://ihtik.lib.ru/2012.03_ihtik_mathematic/
2. Combinatorial Optimization and Theoretical Computer Science, Vangelis Th. Paschos, 2008
3. Theory of Computation, George Tourlakis, 2012
4. Logic in Computer Science, 2nd edition, Michael Huth, Mark Ryan, 2004
5. Applied Computer Science, Shane Torbert, 2011
6. Concise Guide to Computation Theory, Akira Maruoka, 2011-05-06
7. Theoretical Computer Sciences: Lectures given at a Summer School of the Centro Internazionale Matematico Estivo (C.I.M.E.) held in Bressanone ... June 9-17, 1975 (C.I.M.E. Summer Schools) , F. Preparata, 2011-06-03

Notes:

FS: Fall semester

NUMERICAL ANALYSIS

Semester: 5 semester

Course Type: lectures and lab exercises

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

ECTS Credits: 7.5 credits

Department: Informatics

Course Status: Compulsory Course in the Information Systems and Technologies B.S. Curriculum

Course Description: The course in Numerical Analysis includes basic numerical methods of mathematical analysis and algebra: interpolation and least squares data fitting as methods for approximating functions given by tabulated data; numerical differentiation; numerical integration – Newton-Cotes and Gauss quadrature formulas; numerical solution of nonlinear equations; numerical solution of linear systems of algebraic equations.

Course Objectives: Students should obtain knowledge and skills for numerical solutions of problems in the area of mathematical analysis and algebra, which are applicable for solving various problems.

Teaching Methods: lectures and lab exercises

Requirements/Prerequisites: Mathematical Analysis, Linear Algebra, Analytic Geometry, Differential Equations

Assessment: Written final exam covering problems /omitted in case the average grade of two current problem tests is higher than Very Good 4.50/ (grade weight is 30 %) and theory on two topics (grade weight is 30 %); two homework (grade weight is 20 %) and two projects (grade weight is 20 %).

Registration for the Course: not necessary

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

References:

Basic Titles:

1. Yordanka Angelova – „Numerical Analysis for BSc students", Chemical, Technological and Metallurgical University, Sofia, 2006 (in Bulgarian).
2. D. T. Boyadzhiev, Snezhana Gocheva-Ilieva, I. V. Makrelov, L. I. Popova – „Numerical Analysis Handbook", Part I, 3-rd ed., ExPress, Gabrovo, 2010 (in Bulgarian).
3. D. T. Boyadzhiev, Snezhana Gocheva-Ilieva, L. I. Popova – „Numerical Analysis Handbook", Part II, Demetra, Sofia, 2012 (in Bulgarian).
4. B. Boyanov – "Lectures on Numerical Analysis", Darba Publishing House, Sofia, 1995 (in Bulgarian).
5. Snezhana Gocheva-Ilieva – "Computer Numerical Analysis", Paisii Hilendarski Plovdiv University Press, Plovdiv, 2013 (in Bulgarian) (also available online).
6. Stefka Dimova, Tatiana Chernogorova, Angelina Yotova – "Numerical Methods for Differential Equations", St. Kliment Ohridski Sofia University Press, Sofia, 2010 (in Bulgarian).
7. Konstantin Kazakov – „Finite elements method for modeling building constructions", Prof. Marin Drinov Academic Press, Sofia, 2010 (in Bulgarian).
8. M. Kaschiev – "Numerical Analysis Handbook", Martilen Publishing House, Sofia, 1994 (in Bulgarian).
9. "Numerical Analysis Problem Book", 2-nd ed., St. Kliment Ohridski Sofia University Press, Sofia, 1994 (in Bulgarian).
10. V. Pasheva – "Introduction to Numerical Analysis", Technical University-Sofia, 2009.
11. Bl. Sendov, V. Popov – "Numerical Analysis", Part I, Kliment Ohridski Sofia University Press, Sofia, 1996; Part II, Nauka and Izkustvo Publishing House, Sofia, 1978 (in Bulgarian).

Additional Titles:

1. R. L. Burden, J. D. Faires – "Numerical Analysis", 9-th ed., Cengage Learning, Stamford, CT, USA, 2010.
2. Rizwan Butt – "Introduction to Numerical Analysis using Matlab", Jones and Bartlett Publishers, Sudbury, MA, USA, 2009.
3. C. D. Conte, Carl de Boor – "Numerical Analysis: An Algorithmic Approach", 3-rd ed., McGraw Hill Education, Columbus, OH, USA, 2005.
4. J. D. Faires, R. L. Burden – "Numerical Methods", Brooks/Cole Publishing Company, Pacific Grove, CA, USA, 2002.
5. Timothy Sauer – "Numerical Analysis", 2-nd ed., Pearson Education, London, 2011.
6. S. M. Stefanov – "Numerical Analysis", MS4004-2203, Limerick, 1998.
7. William F. Trench – "Elementary Differential Equations with Boundary Value Problems. Student Manual", Trinity University, San Antonio, Texas, USA, 2013 (also available online).

Abbreviation:

FS: Fall Semester
SS: Spring Semester

OPERATIONAL RESEARCH

Semester: 5 semester

Course Type: lecture

Hours per week/FS/SS: 2 lecture; 1 exercise week/ FS

ECTS credits: 4,5

Department: Department of Computer Science

Course Status: Optional course in the Information systems and technologies.

Course Description: The aim of the research operation is quantitative analysis and finds a solution by management system.

Course Aims: Students should obtain knowledge and skills to find the optimal solution in the analyzing problem.

Teaching Methods: lectures, demonstrations and work on project

Requirements/Prerequisites: Linear algebra, Computer languages. optimization theory.

Assessment: course project

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

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

References:

Basic Titles:

1. Венцель И. Исследования операции. Москва, 1970.
2. Vagner G. Operational research Vol I-III 1998.

Abbreviation:

FS: Fall Semester

SS: Spring Semester

MATHEMATICAL FUNDAMENTALS OF COMPUTER GRAPHICS

Semester: 5 semester

Course Type: lectures and tutorials in computer lab

Hours per week/FS/SS: 2 lecture, 1 labs week/FS

ECTS credits: 4.5

Department: Department of Computer Science

Course Status: Optional course in the Information System and Technologies B. S. Curriculum.

Course Description: The course introduces a theoretical and practical introduction to the mathematical fundamentals of computer graphics. Basic concepts, terms, approaches, and methods used in computer graphics are presented. This knowledge would support the development of software applications related to computer graphics, and the modelling of real-world objects and processes.
The course is adapted towards the students of the " Information Systems and Technologies " specialty, and a good mastery of the proposed material is essential for the creation of high-quality computer games and computer models of real-world objects.
It is a continuation of the courses in Computer Design of Printed and Promotional Materials, Computer Mathematics, and Mathematical Analysis.

Course Objectives This course aims to provide knowledge of the students about the mathematical methods and algorithms used in computer graphics and their implementation in real software applications.

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

Requirements: Basic knowledge of programming, computer mathematics, and mathematical analysis are required.

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: 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. John Vince (2017) "Mathematics for Computer Graphics" (Undergraduate Topics in Computer Science), 5th Edition, Springer.
2. Стоян Малешков, Веселин Георгиев (2014) "Компютърна графика и фотореалистична визуализация", Нов български университет, София.
3. Eric Lengyel (2012) "Mathematics for 3D Game Programming and Computer Graphics", 4th Edition, Cengage Learning PTR.
4. Peter Shirley, Steve Marschner (2018) "Fundamentals of Computer Graphics", CRC Press.
5. Frank Klawonn (2008) "Introduction to Computer Graphics Using Java 2D and 3D", Springer.
6. Donald Hearn, M. Pauline Baker (1996) "Computer Graphics C Version", 2nd Edition, Prentice Hall
7. Mike Bailey, Steve Cunningham (2016) "Graphics Shaders: Theory and Practice", 2nd Edition, CRC Press.
8. John Collomosse (2008) "Fundamentals of Computer Graphics - CM20219", Lecture Notes, University of Bath, UK.
9. John F. Hughes, Andries Van Dam, Morgna McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley (2014) "Computer Graphics: Principles and Practice", 3rd Edition, Addison Wesley.
10. Steven J. Janke (2015) "Mathematical structures for computer graphics", John Wiley & Sons, Inc.
11. Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto (2015) "Introduction to Computer Graphics. A practical Leaning Approach", CRC Press.
12. Edward Angel, Dave Shreiner (2012) "Interactive Computer Graphics. A Top-Down Approach with Shader-Based OpenGL®", 6th Edition, Addison-Wesley

Abbreviation:

FS: Fall Semester

SS: Spring Semester

MATHEMATICAL THEORY OF DATABASE

Semester: 5th semester

Course Type: lecture

Hours per week/FS/SS: 3 lecture; 1 exercise week/FS

Credits Numbers: 4.5

Department: Department of Computer Science, telephone: 8889132

Course Status: Optional course in the Information systems and technologies

Course Description: In this course we present the differences between the traditional, no database approach to information system design and the database approach.

Course Aims: Students should obtain knowledge and skills for designing of real database.

Teaching Methods: lectures, demonstrations and work on project

Requirements/Prerequisites: Linear algebra, Computer languages.

Assessment: course project

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

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

References:

Basic Titles:

1. Pavel Azalov. Database. Relation and objective approach, Tehnika, 1991 r.
2. J .C. Shepherd, Database Management: Theory and application. 1990, Boston

Abbreviation:

FS: Fall Semester
SS: Spring Semester

PROGRAMING WITH OBJECT PASCAL AND DELPHI

Semester: 5th semester

Type of Course: lectures and lab

Hours per week: 2 lectures + 1 lab per week/WS

Credits Numbers: 4.5

Department: Informatics

Course Status: Optional course from the Computer Science Bachelor Curriculum.

Course description: In the course students are introduced with methods and means of Object-oriented programing in integrated development interface for visual programing - Delphi. The students should have a basic knowledge on programming with Pascal. Suppose that students are success ability passed courses in Programming and Data structures and Object-oriented programming (in SWU these courses are basic on program language C++) and students are known for fundamental skills in programming. In the course students develop programs using different platform and language - Object Pascal and Delphi.

Objectives: Basic objectives and tasks:

- The students give knowledge for algorithm thinking;
- to give knowledge for Data structures, that can process with computer;
- to give knowledge for methods and skills in Object-oriented programming in integrated development environment for visual programming;
- to give knowledge for syntax of another program language (Object Pascal and Delphi);
- to give knowledge for good style in programming;
- to give knowledge for basic principles when develop applications.

Methods of teaching: lectures and lab

Pre-requirements: Basic knowledge in "Programming and Data structures".

Exam: two course projects and final exam

Registration for the Course: A request is made by students at the end of the current semester

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

References:

1. Франк Елер Delphi 6. „ИнфоДАР", 2001.
2. Христо Крушков Програмиране с Delphi. Пловдив, „Макрос", 2004.
3. Мартин Гардън Delphi – създаване на компоненти. АмПрес, 1999.
4. Хавиер Пачеко, Стийв Тейхера Delphi 5, т.1, т.2, т.3, „ИнфоДар", 1999
5. Хавиер Пачеко, Стийв Тейхера Delphi 5 – ръководство за напреднали. „ИнфоДАР", 1999.
6. Марко Канту, Mastering Delphi 6, т.1, т.2, "Софтпрес", 2002

Abbreviation:

WS: Winter Semester, SS: Summer Semester
(or FS: Fall Semester, SS: Spring Semester)

PROGRAMMING WITH C++ BUILDER

Semester: 5th semester

Type of Course: lectures and labs

Hours per week - 2 lectures + 1 labs per week/WS

Credits Numbers: 4.5 credits

Department: Informatics

Course Status: Optional course in the Information Systems and Technologies B.S. Curriculum

Course description: In the course students are introduced with methods and means of Object-oriented programming in integrated development interface for visual programming – C++ Builder. The students should have a basic knowledge on programming. Suppose that students are success passed courses in Programming and Data structures and Object-oriented programming (in SWU this courses are basic on program language C++) and students are known for fundamental skills in programming. In the course students develop programs using different platform – C++ Builder.

Objectives: Basic objectives and tasks:

- The students give knowledge for algorithm thinking;
- to give knowledge for Data structures, that can process with computer.
- to give knowledge for methods and skills in Object-oriented programming in integrated development environment for visual programming;
- to give knowledge for good style in programming;
- to give knowledge for basic principles when develop applications.

Methods of teaching: lectures and labs

Pre-requirements: Basic knowledge in „Programming and Data structures" and „Object-oriented programming".

Exam: two course projects and final exam

Registration for the Course: A request is made by students at the end of the current semester

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

References

1. Richard Kaiser, A.v. Biljon, C.Y. Crocker, and P. Lietmeyer. C++ with Borland C++Builder: An Introduction to the ANSI/ISO Standard and Object-Oriented Windows Programming, 2008
2. Jarrod Hollingworth, Bob Swart, Mark Cashman, and Paul Gustavson. Borland C++ Builder 6 Developer's Guide, 2002
3. Satya Sai Kolachina. C++ Builder 6 Developers Guide with CDR (Wordware Delphi developer's library), 2002
4. Borland C++ Builder: The Complete Reference by Herbert Schildt and Gregory L. Guntle (Paperback - April 25, 2001)
5. John Miano, Thomas Cabanski, and Harold Howe. Borland C++ Builder: The Definitive C++ Builder Problem Solver, 1997

6. Kent Reisdorph and Ken Henderson. Sams Teach Yourself Borland C++ Builder in 21 Days, 1997

Abbreviation:

WS: Winter Semester, SS: Summer Semester,
(or FS: Fall Semester, SS: Spring Semester)

JAVASCRIPT PROGRAMMING

Semester: 5 semester

Type of Course: lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 1 hours tutorials in computer lab/ spring semester.

Credits Numbers: 4,5 credits

Department: Informatics

Course Status: Elective course

Course description: The course is introduction in design and development of JavaScript applications and interfaces of Web based information systems.

Objectives: The student should obtain knowledge of:

- Design and implementation of JavaScript applications.
- Design and implementation JavaScript client interfaces of Web-based information systems.

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

Pre- requirements: Database systems (core 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: by request at the end of the current semester

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

References:

1. Stefanov, Stoyan, Object-Oriented JavaScript, Packt Publishing, 2008
2. Zakas, N., The Principles of Object-Oriented JavaScript, No Starch Press, 2014

DOMAIN SPECIFIC LANGUAGES

Semester: 5th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 1 lecture and 2 labs per week / WS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: The course will introduce basic methods for creating language extensions - heterogeneous and homogeneous domain-specific languages. Some of the popular external DSL, and tools to create them will be addressed. By using the so-called. Framework processors in the course will be realized two domain-specific languages.

Course Aims: The course aims to students background with specialized training in the creation of domain-specific languages.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming with C++/Java.

Exam: Final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Markus Voelter, DSL Engineering. Designing, Implementing and Using Domain-Specific Languages, http://dslbook.org, 2013
2. Martin Fowler, Domain Specific Languages, Addison-Wesley Professional, 2010
3. Debasish Ghosh, DSL In Action, Manning Publishing, 2011
4. Блог на Martin Flower http://martinflower.com
5. Markus Voelter, Generic Tools, Specific Languages, 2014
6. Martin Fowler, Patterns of Enterprise Application Architecture, Addison-Wesley, 2003
7. Cay Horstmann, Object-Oriented Design and Patterns, Wiley, 2006
8. Ivo Damyanov, Mila Sukalinska, DSL in practice, IJCA, Volume 115 (2), 2015

SOFTWARE QUALITY ASSURANCE

Semester: 6th semester

Course Type: lectures

Hours (weekly)/WS/SS: 1 lecture and 2 labs per week / SS

ECTS Credits: 6,0 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: The course considers the role of QA in the process of software development. The course covers basic ideas, views and major trends on the concept of software quality regarding to standards. Various QA methods such as White Boxes, Black Boxes, Gray Boxes are introduced as well as principles, stages and types of software testing. Various tools for automated testing and bug tracking platforms are studied. Some metrics statistical and probabilistic methods and approaches for assessing the quality of the software product are introduced.

Course Objectives: The course aims to expand the training of students majoring in "CST" in the field of quality control software.

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

Requirements/Prerequisites: Needed basic knowledge of operating systems, programming, computer architectures, computer networks and communications.

Assessment: written final exam

Course enrolment: the course is compulsory

References:

1. Иванов М.П., И. Момчев, Принципи и проблеми на многокритериалната оценка на качеството на софтуерния продукт, сп. "Автоматика и информатика", 2006
2. Мартин Иванов, Принципи и перспективи за оценка на качеството на софтуерните продукти (http://eprints.nbu.bg/505/1/PRINCIPLES_AND_PERSPECTIVES.pdf)
3. ISO, International Organization for Standardization, "ISO 9126-1:2001, Software engineering – Product quality, Part 1: Quality model", 2001.
4. Stephen Kan H. , Metrics and Models in Software Quality Engineering, 2nd Edition, Addison Wesley Professional., 2002.
5. J. Kuruvilla, JIRA 5.x Development Cookbook, Packt Publishing, 2013
6. Elfriede Dustin, Jeff Rashka, John Paul, Automated Software Testing: Introduction, Management, and Performance, Addison-Wesley Professional, 1999

7. James D. McCaffrey, Software Testing: Fundamental Principles and Essential Knowledge, 2009
8. Patrik Berander, Software quality attribute and trade-offs, Editors: Lars Lundberg, Michael
9. Mattsson, Claes Wohlin, Blekinge Institute of Technology , June 2005
10. Dick S., A. Kandel, Computational Intelligence In Software Quality Assurance, Series in Machine Perception and Artificial Intelligence - Vol. 63, 2005.

WEB CONTENT MANAGEMENT

Semester: 6th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 1 lab per week / SS

ECTS Credits: 7.5 credits

Department: Department of Computer Science

Course Status: Compulsory course from the Computer Systems and Technologies Bachelor Curriculum.

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. Денис Колисниченко, Да направим собствен сайт, Асеневци, 2015

2. Тим Кибермaн, На първо място в Google - 2015, Франчайзинг БГ, 2015
3. Michael Kuhlmann, Social Media for Wordpress, Packt Publishing, 2012
4. 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
5. Dan Zarrella, The Social Media Marketing Book, O'Reilly Media, 2009
6. Brad Williams, David Damstra, Hal Stern, Professional WordPress, 3rd Edition, Wrox Publishing, 2015
7. John West, Professional Sitecore Development, Wrox Publishing, 2012
8. Alan Harris, Pro ASP.NET 4 CMS, Apress, 2010
9. Amanda Perran, Shane Perran, Jennifer Mason, Laura Rogers, Beginning SharePoint 2013, Wrox Publishing, 2013
10. Nik Wahlberg, Paul Sterling, Umbraco User's Guide, Wrox Publishing, 2011

PROBABILITY AND STATISTIC

Semester: 6 semester

Type of Course: lectures and tutorials in computer lab

Hours per week – 2 hours lectures, 2 hours tutorials in computer lab/winter semester

Credits Numbers: 7.5 credits

Department: Informatics

Course Status: Obligatory course in curriculum of major Informatics. Bachelor degree.

Course description: In this course questions of Probability and Mathematical Statistics are considered. Algorithms connected with finding structural and numerical characteristics of graph's are represented. Basic notion of Probability and Statistics are considered connected with Theory of Estimations, and Decision Theory in case of big and small samples, testing of hypothesis based on models about the probability distributions of the features in the investigated population.

Objectives: The students should obtain knowledge and understanding that the intercourse character needs to discover the connection Mathematics- Informatics- Physics- Economics and much more other sciences.

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

Pre-requirements: It is helpful the students have some knowledge in Analysis and Information Technology

Assessment and Evaluation: Two tests during the semester, the results of which are part of the final grade. The course is successful completed with at least 65% of all scores.

Registration for the Course: Obligatory course

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

PRACTICAL COURSE IN DATABASES

Semester: 6 semester

Course Type: Seminar and lab exercises

Hours per week FS/SS: 1 seminar hour and 2 labs hours per week /SS

ECTS credits: 4.5 credits

Department: Department of Informatics

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

Course Description: The course is practical and consolidate existing knowledge of students on the design of circuits of relational databases. Consider the process of normalization of relational schemes, as well as the physical creation of relational databases. Confirms is the syntax and use of basic SQL structures - create, insert, update, delete, select and others that are related to creating tables and relations between them, enter, update, delete and retrieval of data from relational databases. Particular attention is paid to the junction of the tables and work with views, as well as grouping of data and the use of aggregate functions. Finally considered milestones in the development of applications for working with databases, as well as designing and developing user interface applications of this type.

Course Objectives: The aim of the course is to expand knowledge of databases, focusing on the use of applications and the creation of software for working with databases that have limited functionality. After completing the course students should be able to: - design schemes of relational databases; - Have skills to work with SQL queries; - Have mastered various techniques and approaches for development of software in the field of databases.

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

Requirements/Prerequisites: Needed basic knowledge of information technology, databases, object-oriented programming, and work with MS Access. Desirable Knowledge of programming languages C++, Object Pascal and/or C #.

Assessment:

a) Current control
   - Tasks for implementation during lab activities - n numbers by n <= number of exercises, ie Z1, Z2, ..., Zn;
   - Extramural activity - production of paper - R to a given topic;

- Course Project - Development of design project K over a predetermined theme;

The current assessment (CC) = 0,5 * ((Z1 + Z2 + ... + Zn) / N) + 0,2 * R + 0,3 * K
Students with a current control > = 3.00 are examined;

b) Examination Assessment (EA) - written exam on a six-level system with an accuracy of 0.25;
c) Final assessment (FA) = 0.5 * (CC) + 0.5 * (EA);
The final result is a six-point scale: 2, 3, 4, 5 or 6.

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

Registration for the Exam: Coordisnated with lecturer and Student Service Department

References:

1. Andy Oppel. Databases: A Beginner's Gudie. McGraw-Hill. 2009
2. Rod Stephens. Beginning Database Design Solutions (Wrox Programmer to Programmer). Paperback, 2008
3. Ramez Elmasri and Shamkant Navathe. Fundamentals of Database Systems (6th Edition), Addison-Wesley; 6 edition (April 9, 2010)
4. Basit A. Masood-Al-Farooq. SQL Server 2014 Development Essentials. Packt Publishing. 2014
5. Gavin Powell. Beginning Database Design. Wiley Publishing, Inc. 2006.
6. Paul Wilton, John W. Colby. Beginning SQL. Wiley Publishing, Inc. 2005.
7. Thomas M. Connolly, Carolyn E. Begg. Database Systems - A Practical Approach to Design, Implementation, and Management (Fourth Edition). Pearson Education Limited 2005.

Abbreviation:

FS: Fall Semester
SS: Spring Semester

PRACTICUM IN LOGIC PROGRAMMING

Semester: 6 semester

Type of Course: Eligible

Hours per week - 3 per week

Credits Numbers: 4,5

Department: Computer science

Course Status: Optional course from the Computer Science Master Curriculum.

Course description: The course provides introduction to logic programming. The main techniques of the structural approach of programming and their application using Prolog programming language are introduced.

Objectives: The aim of the course is to teach the students with the techniques in development of algorithms and programmers using Prolog programming language. The knowledge will be used in the general theoretical, and some special courses for example programming for artificial intelligence

Methods of teaching: labs in computer classroom

Pre-requirements: Basic knowledge in "Programming and Data structures" and "Mathematical Logics".

Exam: Individual programming task and the general student's work during the semester.

Registration for the Course: necessary

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

References:

1. М. Тодорова Езици за функционално и логическо програмиране, втора част Логическо програмиране. София, Сиела, 2003.
2. И. Держански, И. Ненова "Пролог за лингвисти." Tempus S-JEP-07272-94, 1997.
3. W. F. Clocksin, C. S. Mellish "Programming in Prolog" Springer-Verlag, 1984.
4. I. Bratko "Prolog Programming for Artificial Intilligence. Addison-Wesley,1986.
5. G. Metakides, A. Nerode "Principles of Logic and Logic Programming" Elsever, 1996.
6. John Malpas "Prolog: A Relational Language and its Application.Prentis-Hall,1987.
7. A. Thayse, P. Gribomont, G. Louis, D. Snyers, P. Wodon, P. Goshet, E. Gregoire, E. Sanchez, Ph. Delsarte "Approshe Logique de L'Intelligence Artificielle. Paris, Bordas, 1988.
8. J. Doores, A. R. Reiblein, S. Vadera "Prolog – programming for tomorrow" Sigma Press, 1987.

WORKSHOP ON ASYNCHRONOUS AND PARALLEL PROGRAMMING WITH THE .NET FRAMEWORK

Semester: 6th semester

Course Type: practical labs

Hours (weekly)/WS/SS: 2 labs per week / SS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: Modern computer architectures and rich user interface impose new requirements on the performance and responsive interface. All of this nowadays is achieved through parallel architectures, multithreaded and asynchronous tasks execution. The course emphasizes the practical implementation with .NET Framework such as Parallel LINQ, TPL and others.

Course Aims: The course aim is to give theoretical and practical background to students on the principles of parallel and asynchronous processing with Microsoft .NET Framework.

Teaching Methods: Labs, Discussions, Project Based Methods

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming with C++/Java, Operating Systems.

Exam: final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester.

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

References:

1. Пламенка Боровска, Милена Лазарова, Паралелна информационна обработка: Системни архитектури, паралелни алгоритми, паралелно програмиране, Сиела, 2007
2. Alex Davies, Async in C# 5.0, O'Reilly Media, 2012
3. Rodney Ringler, C# Multithreaded and Parallel Programming, Packt Publishing, 2014
4. John Cheng, Max Grossman, Ty McKercher, Professional CUDA C Programming, Wrox Publishing, 2014
5. Светлин Наков и Веселин Колев, Въведение в програмирането със C#, Фабер, 2011, ISBN: 978-954-400-527-6
6. Eric Gunnerson and Nick Wienholt, A programmer's Guide to C# 5.0, APress, 2012
7. Daniel Solis, Illustrated C# 2012, 2nd.Edition. APress, 2012
8. Thuan Thai and Hoang Lam, .NET Framework Essentials, 2nd Edition, O`Reilly, 2002, ISBN 0-596-00302-1

BITWISE OPERATIONS, GRAPHS AND COMBINATORIAL APPLICATIONS

Semester: 6th semester

Type of Course: lectures

Hours per week: 1 lecture, 1 seminar, 1 lab

Credits Numbers: 4,5

Department: Informatics

Course Status: Elective course from the Computer Science Bachelor Curriculum.

Course description: This elective course is the result of long work of the author as a scientist and lecturer in discrete mathematics and programming. It collected a number of scientific, scientific-methodological and applied research of the author in this field have been reflected in over 80 publications in leading journals. The idea of the discussed issues arise as we try to select appropriate examples in our work with talented students, yet touching to the modern scientific achievements. So naturally solving the current problem of the relationship between university education and modern science, we received the results, which definitely have a private scientific and practical value.

Aims and scopes: The aim of the course is to examine some combinatorial algorithms and their applications over binary matrices, finite sets and graphs.

Tasks:

- To provide interesting and meaningful examples where the use of bitwise operations increases the efficiency of algorithms;
- To make a mathematical model describing the structural diversity of different types of braiding the threads in the weaving of fabrics (weaving weaves). To solve some combinatorial problems related to these issues;
- To implement algorithms for operations on sets using bitwise operations;
- To realize the algorithm using operations on sets for solving any Sudoku;
- To study some combinatorial problems related to the puzzle Sudoku;
- With the help of set theory and relational algebra to make a mathematical model of any psychological testing;
- Two binary matrices are equivalent if one can be obtained from the other by moving some of the rows and / or columns. To investigate the factor-set on the so defined relation;
- To find a number of mutually disjoint pairs of S-permutation matrix;
- Describe some new graphs and set models in computer linguistics. Based on these models to describe a polynomial algorithm that verifies whether any context-free language is a subset of a group language.

Expected results:

- Proof of the fact that to be a good programmer required advanced mathematical knowledge and skills.
- Students to learn the algorithmic thinking;
- to form logical well individual steps in solving any task;

- to use Boolean algebra, matrix arithmetic graph theory and combinatorics in their future work;
- to assimilate data structures that can be processed by computer;
- to learn some already have become some classic algorithms, as well as to create their own algorithms;
- to evaluate the effectiveness of the algorithms, applying strictly mathematical proofs.

Methods of teaching: Lectures illustrated with school boards, slides, presentations, multimedia projector. Talks and discussions.

Pre-requirements: Students must have basic mathematical knowledge and skills in programming.

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

Registration for the Course: it is necessary (an elective course)

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

References:

Main:

1. К. Йорджев, Побитови операции, графи и комбинаторни приложения. ЮЗУ „Н. Рилски", Благоевград, 2014.

Additional:

1. K. Yordzhev (Iordzhev), An n^2 Algorithm for Recognition of Con\-text-free Languages. Cybernetics and Systems Analysis, 29, No.6 (1993) 922-927. http://link.springer.com/article/10.1007\%2FBF01122746
2. K. Yordzhev, An Entertaining Example of Using the Concepts of Context-Free Grammar and Pushdown Automation. Open Journal of Discrete Mathematics, 2 (2012), 105-108, http://www.scirp.org/journal/PaperInformation.aspx?PaperID=21127
3. K. Yordzhev, Some Combinatorial Problems on Binary Matrices in Programming Courses. Informational Technologies in Education, № 12, (2012) 39-43. http://ite.kspu.edu/en/issue-12/p-39-43
4. K. Yordzhev, Random Permutations, Random Sudoku Matrices and Randomized Algorithms. International Journal of Mathematical Sciences and Engineering Applications (IJMSEA), ISSN 0973-9424, Vol. 6, No. VI (2012), pp. 291-302. http://www.ascent-journals.com/ijmsea_contents_Vol6No6.html
5. K. Yordzhev, Bipartite Graphs Related to Mutually Disjoint S-permutation Matrices. ISRN Discrete Mathematics, vol. 2012, Article ID 384068, 18 pages, 2012. http://www.hindawi.com/journals/isrn.discrete.mathematics/2012/384068/
6. K. Yordzhev, A Representation of Context-free Grammars with the Help of Finite Digraphs. American Journal of Applied Mathematics. Vol. 1, No. 1 (2013) pp. 8-11. http://article.sciencepublishinggroup.com/pdf/10.11648.j.ajam.20130101.12.pdf

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8. K. Yordzhev, Inclusion of Regular and Linear Languages in Group Languages. International Journal of Mathematical Sciences and Engineering Applications, ISSN 0973-9424, Vol. 7 No. I (2013), pp. 323–336. http://www.ascent-journals.com/ijmsea_contents_Vol7No1.html
9. K. Yordzhev, Bitwise Operations Related to a Combinatorial Problem on Binary Matrices. I. J. Modern Education and Computer Science, 4 (2013) 19-24. http://www.mecs-press.org/ijmecs/ijmecs-v5-n4/v5n4-3.html
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11. K. Yordzhev, The Bitwise Operations Related to a Fast Sorting Algorithm. International Journal of Advanced Computer Science and Applications, Vol. 4, No. 9 (2013) 103-107. http://thesai.org/Downloads/Volume4No9/Paper_17-The_Bitwise_Operations_Related_to_a_Fast_Sorting.pdf
12. K. Yordzhev, On an Algorithm for Obtaining All Binary Matrices of Special Class Related to V. E. Tarakanov's Formula. Journal of Mathematical Sciences and Applications, 1, no. 2 (2013): 36-38. http://pubs.sciepub.com/jmsa/1/2/5/jmsa-1-2-5.pdf
13. K. Yordzhev, On an Algorithm for Isomorphism Free Generations of Combinatorial Objects. International Journal of Emerging Trends & Technology in Computer Science, Vol. 2, No. 6 (2013) 215–220. http://www.ijettcs.org/Volume2Issue6/IJETTCS-2013-12-21-080.pdf
14. K. Yordzhev, Fibonacci sequence related to a combinatorial problem on binary matrices. American Journal Mathematics and Sciences (AJMS), ISSN 2250 3102, Vol. 3, No. 1 (2014), 79–83. http://ajms.yolasite.com/resources/12.Fibonacci.pdf (preprint arXiv:1305.6790 http://arxiv.org/pdf/1305.6790v2.pdf)
15. K. Yordzhev, Factor-set of binary matrices and Fibonacci numbers. Applied Mathematics and Computation, 236, (2014), 235–238. http://www.sciencedirect.com/science/article/pii/S0096300314004354
16. K. Yordzhev, On the probability of two randomly generated S-permutation matrices to be disjoint. Statistics & Probability Letters, 91 (2014). http://www.sciencedirect.com/science/article/pii/S0167715214001370
17. I. Peneva, K. Yordzhev, Adnan Sharaf Ali, The Adaptation of Translation Psychological Test as a Necessary Condition for Ensuring the Reliability of Scientific Research. International Journal of Engineering Science and Innovative Technology, Volume 2, Issue 4, July 2013, 557-560. http://www.ijesit.com/Volume%202/Issue%204/IJESIT201304_71.pdf

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19. K. Yordzhev, H. Kostadinova, Mathematical Modeling in the Textile Industry. Bulletin of Mathematical Sciences & Applications, Vol. 1, No. 1 (2012), 20–35. http://www.bmsa.us/admin/uploads/00Czn3.pdf
20. K. Yordzhev, I. Peneva, Computer Administering of the Psychological Investigations – Set-Relational Representation, Open Journal of Applied Sciences, Vol 2, No 2, (2012) 110–114. http://www.scirp.org/journal/PaperInformation.aspx?PaperID=20331
21. K. Yordzhev, On an equivalence relation in the set of the permutation matrices. in Discrete Mathematics and Applications, SWU "N. Rilski", Blagoevgrad, Bulgaria, 2004, 77–87.
22. K. Yordzhev, On a Class of Binary Matrices. Mathematics and Educations in Mathematics, v.37 (2008), 245–250. http://www.math.bas.bg/smb/2008_PK/2008/pdf/245-250.pdf
23. K. Yordzhev, An Example for the Use of Bitwise Operations in programming. Mathematics and education in mathematics, 38 (2009), 196–202. http://www.math.bas.bg/smb/2009_PK/tom_2009/pdf/196-202.pdf
24. K. Yordzhev, On some numerical characteristics of a bipartite graph. Mathematics and education in mathematics, 43 (2014), 101–104. http://www.math.bas.bg/smb/2014_PK/tom_2014/pdf/150-153.pdf
25. H. Kostadinova, K. Yordzhev, A Representation of Binary Matrices. in Mathematics and education in mathematics, 39, (2010), 198–206. http://www.math.bas.bg/smb/2010_PK/tom/pdf/198-206.pdf
26. H. Kostadinova, K. Yordzhev, An Entertaining Example for the Usage of Bitwise Operations in Programming. Mathematics and natural science, v. 1, SWU "N. Rilski", (2011), 159-168. http://www.fmns.swu.bg/FMNS2011_Volume_1.pdf
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28. I. Peneva, K. Gaidarov, K. Yordzhev, Computer Administering of Psychological Tests. Mathematics and Natural Sciences, v.1, SWU N. Rilsky, Blagoevgrad, 2009, 129-135. http://www.fmns.swu.bg/Fmns2009.html
29. G. Praskova, I. Petrov, K. Yordzhev, I. Peneva, Online Generation of Psychological tests. Mathematics and natural science-2013, Volume 1, SWU N. Rilsky, Blagoevgrad, Bulgaria, 2013, 235-240. http://www.fmns.swu.bg/FMNS2013-Volume_1.pdf
30. K. Yordzhev, H. Kostadinova, Mathematical Modeling of the Weaving Structure Design. Mathematics and education in mathematics, 39 (2010). http://www.math.bas.bg/smb/2010_PK/tom/pdf/212-220.pdf

31. K. Yordzhev, I. Peneva, B. Kirilieva-Shivarova, A relational Model of Personality Psychological Tests. Mathematics and Natural Sciences, v.1, 2009, 69-77. http://www.fmns.swu.bg/Fmns2009.html
32. К. Йорджев, Х. Костадинова, Приложение на математически методи в сплиткознанието за получаване на количествени оценки на многообразието на тъкачните сплитки. Текстил и облекло, 1, (2011), 7–10.
33. И. Калчев, К. Йорджев, В. Вачков, Стохастични измервателни системи, Технически Университет, София, 2007.
34. И. Пенева, К. Йорджев, Интернет тестирането най-новата тенденция в психодиагностичните изследвания. Trakia journal of sciences, Volume 7, 2009, 155-159. http://tk.uni-sz.bg/files/M10_et_al.pdf
35. С. Щраков, К. Йорджев, М. Тодорова, Ръководство за решаване на задачи по дискретна математика. Благоевград, ЮЗУ "Н. Рилски", 2004.

MANAGEMENT AND FINANCING OF EDUCATIONAL AND SCIENTIFIC PROGRAMS

Semester: 6th semester

Course Type: Lectures and practical seminar

Hours (weekly)/WS/SS: 2-hours' lectures, 1-hour seminar per week / SS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

DESIGN AND DEVELOPMENT OF HUMAN COMPUTER INTERACTIONS

Semester: 6 semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 1 hour lectures, 1 hour seminar, and 1 hour tutorials in computer lab/autumn semester.

Credits Numbers: 4,5 credits

Department: Informatics

Course Status: Elective course in curriculum of major Information Systems and Technologies, bachelor's 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, phycology 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

1. 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/
2. Interaction Design, https://www.interaction-design.org/literature/topics/human-computer-interaction
3. Helen Sharp, Jennifer Preece, Yvonne Rogers, Interaction Design: Beyond Human-Computer Interaction Whiley, 2019

On-line resources

1. URL http://www.e-learning.swu.bg

NORMS AND STANDARDS OF INFORMATION SECURITY

Semester: 6th semester

Course Type: lectures

Hours (weekly)/WS/SS: 2 lectures per week / SS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Course description: The development of e-business requires secure infrastructure. Adopting a policy of compliance with world standards allows companies and organizations to implement best practices. Information systems protection requires special regulations. Therefore criteria, standards, and in some cases, legislation on information security are set up. This ensure an adoption of best practices and adequate level of information security.

Course Objectives: Students gain knowledge and skills to cope with every day and specific tasks related to the implementation of norms and standards related to information security. Get acquainted with the various policies and regulations for information security.

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

Requirements/Prerequisites: Needed basic knowledge of operating systems, programming, computer architectures, computer networks and communications.

Assessment: written final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

References:

1. Mark Rhodes-Ousley, Information Security (Second Edition), The complete reference, McGraw-Hill, 2013
2. Brady Orand, Foundations of IT Service Management with ITIL 2011: ITIL Foundations Course in a Book, 2011
3. Edward Humphreys, Implementing the ISO/IEC 27001 Information Security Management System Standard, Artech House, 2007
4. Jule Hintzbergen, Foundations of Information Security Based on ISO27001 and ISO27002, Van Haren Publishing, 2010
5. Cybercrime Exposed, McAfee White paper (http://www.mcafee.com/us/resources/white-papers/wp-cybercrime-exposed.pdf)

6. Сайт на Националният Център за Действие при Инциденти в Информационната Сигурност (https://govcert.bg/)
7. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов, Защита на компютърната информация, УИ „Неофит Рилски“, 2005
8. https://www.pcisecuritystandards.org/security_standards/documents.php
9. http://www.itil-officialsite.com/
10. http://www.iso.org/iso/standards_development/processes_and_procedures/iso_iec_directives_and_iso_supplement.htm

DECRIPTION OF THE COURSES AT THE FOURTH YEARS

INTERNET PROGRAMMING

Semester: 7 semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 2 hours tutorials in computer lab/autumn semester.

Credits Numbers: 6 credits

Department: Informatics

Course Status: Core course in curriculum of major IST, Bachelor's degree.

Course description: The course is introduction in design and programming of Internet/Intranet Web-based information systems. Combination of HTML, Java-applets and MySQL/PHP/Apache technologies is considered in practical aspects.

Objectives: Basic objectives and tasks:

- The students give knowledge for algorithm thinking.
- to give knowledge for Data structures, that can process with computer.
- to give knowledge for methods and skills in programming.
- to give knowledge for good style in programming.
- to give knowledge for basic principles when develop applications.
- to give knowledge for design and programming of Internet/Intranet Web-based information systems.
- to give knowledge to practical aspects of HTML, Java-applets, and MySQL/PHP/Apache technologies.

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

Pre - requirements: "Introduction to programming", "Object oriented programming", "Programming and data structures" and "Database systems".

Assessment and Evaluation: Written examination 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. Larry Ullman, PHP for the Web: Visual quickstart guide, Peachpit Press, 2016.
2. Денис Колисниченко, PHP 7 & MySQL - практическо програмиране, Асеневци, 2016

3. Саймън Стобърт, Дейвид Парсънс, Динамични уеб приложения с PHP и MySQL, DuoDesign, 2010
4. Мери Милхолън, Джеф Кастрина, Създаване на Web страници – бързо и ефективно. СофтПрес, 2014.
5. Нина В. Комолова, Елена С. Яковлева, HTML – самоучитель. Питер, 2011.
6. Сергей Соколов, CSS 3 в примери, Асеневци, 2009.
7. Adobe Dreamweaver CS – официален учебен курс. СофтПрес, 2008.
8. Дори Смит, Java за World Wide Web. ИнфоДАР, 2008.
9. BrianP. Hogan, HTML5 and CSS3. Develop with Tomorrow's Standards Today, Pragmatic Programmers, 2010
10. BrianP. Hogan, Web Design for Developers. A Programmer's Guide to Design Tools and Techniques, Pragmatic Programmers, 2010
11. Robin Nixon, Learning PHP, MySQL, and JavaScript, O'Reilly Media, 2009

APPLICATIONS FOR MOBILE DEVICES

Semester: 7th semester

Course Type: lectures and lab exercises

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

ECTS credits: 6.0 credits

Department: Informatics

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

Course Description: Over the past few years have seen a rapid development of the market share of mobile devices such as tablets, e-readers and smartphones. Application development gained new meaning as the keyboard and mouse are no longer the main means of managing computing devices. Therefore, appears the need to learn new technologies and programming to create applications with a brand-new ideology. This course is a practical introduction to developing applications for mobile devices. In seminars, students will learn about the different environments to develop mobile applications and acquire basic theoretical knowledge and skills. Details will be discussed and used development environment Microsoft Visual Studio with Xamarin.Forms. It allows students to develop their applications in laboratory work and individual coursework at the end of the course.

Course Objectives: This course aims to provide students with knowledge and additional training in the theory and practice in the development of applications for mobile devices. They will learn about some of the environments to develop of mobile applications and will gain more practical knowledge in development environment Android.

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

Requirements: Needed basic knowledge of operating systems, computer programming and Data structures, object-oriented programming, databases and DBMS.

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: not necessary

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

References:

Basic Titles:

1. Paul Johnson (2018) Using MVVM Light with your Xamarin Apps, Apress.
2. Paul F. Johnson (2015) Cross-platform UI Development with Xamarin.Forms, Packt Publishing.
3. Janathan Peppers (2014) Xamarin Cross-platform Application Development, Packt Publishing.
4. David Britch (2017) Enterprise Application Patterns using Xamarin.Forms, Microsoft Press.
5. Jim Bennett (2018) Xamarin in Action. Creating native cross-platform mobile apps, Manning Publications.
6. Russell Fustino (2018) Azure and Xamarin Forms: Cross Platform Mobile Development, Apress.
7. Charlez Petzold (2016) Creating Mobile Apps with Xamarin.Forms, Microsoft Press.
8. Matthew Leibowitz (2015) Xamarin Mobile Development for Android Cookbook, Packt Publishing.
9. Mark Reynolds (2014) Xamarin Essentials, Packt Publishing.
10. Dan Hermes (2015) Xamarin Mobile Application Development, Apress.
11. Can Bilgin (2016) Mastering Cross-Platform Development with Xamarin, Packt Publishing
12. Christopher Miller (2017) Cross-platform Localization for Native Mobile Apps with Xamarin, Apress.
13. William Smith (2014) Learning Xamarin Studio, Packt Publishing.
14. Mathieu Nayrolles (2015) Xamarin Studio for Android Programming: A C# Cookbook, Packt Publishing.
15. Jonathan Peppers (2014) Xamarin Cross-platform Application Development, Packt Publishing.
16. Michael Williams (2016) Xamarin Blueprints, Packt Publishing.

17. Cesar de la Torre, Simon Calvert (2016) Microsoft Platform and Tools for Mobile App Development, Microsoft Press.
18. Ayan Chatterjee (2017) Building Apps for the Universal Windows Platform, Apress.
19. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid (2016) Beginning Visual C#® 2015 Programming, John Wiley & Sons, Inc.
20. Maximiliano Firtman (2013) Programming the Mobile Web, Second Edition, O'Reilly.
21. Gail Rahn Frederick, Rajesh Lal (2009) Beginning Smartphone Web Development, Apress.
22. Gerald Versulius (2017) Xamarin Continuous Integration and Delivery, Apress.
23. Adam Nathan (2016) Universal Windows® Apps with XAML and C#, SAMS
24. Xamarin.Forms Notes for Professionals; https://books.goalkicker.com/XamarinFormsBook/

Additional Titles:

1. Free ebook: Creating Mobile Apps with Xamarin.Forms; https://blogs.msdn.microsoft.com/microsoft_press/2016/03/31/free-ebook-creating-mobile-apps-with-xamarin-forms/
2. Xamarin.Forms; https://docs.microsoft.com/en-us/xamarin/xamarin-forms/
3. Xamarin; https://docs.microsoft.com/en-us/xamarin
4. Microsoft Visual Studio; https://visualstudio.microsoft.com/

Abbreviation:

FS: Fall Semester

SPECIALIZED STATISTICAL SOFTWARE

Semester: 7 semester

Type of Course: lectures, and tutorials in computer lab

Hours per week: 2 hours lectures, and 1 hours tutorials in computer lab/winter semester

Credits Numbers: 6.0 credits

Department: Informatics

Course Status: Obligatory course in curriculum of major Information systems and technologies, Bachelor's degree

Course description: The course Specialized statistical software /Statistical analysis of data with the help of IT (MS Excel, Statistics, SPSS)/ should introduce students to apply the methods of statistics in practice with the tools of IT.
The main objectives of the modeling the empirical data and application in the IT are introduced in the course. Contemporary technologies used for their application (MS EXCEL, SPSS and STATISTICA) are also included in the course.

Objectives:

- To give students theoretical knowledge of the main statistical procedures, as well as some specifics of their usage.
- To teach students how to create models for statistical analysis of experimental data.
- To present contemporary IT for statistical analysis to the students.
- To prepare students for their future researches.

After successfully completing the course the students should:

- know and be able to apply procedures for statistical analysis of experimental data;
- manage to create, edit, export and import data in contemporary IT;
- be able to create models for statistical analysis of experimental data.

Methods of teaching: seminars, tutorials, discussions, project based method, simulations

Pre- requirements: Probability and Statistics, Information Technology

Assessment and Evaluation

Project- 30%
Final Test- 30%
Individual students works-40%

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

APPLIED STATISTIC

Semester: 7 semester

Type of Course: lectures, seminars, and tutorials in computer lab

Hours per week: 2 hours lectures, 1 hour seminar and 1-hour tutorials in computer lab/winter semester

Credits Numbers: 6.0 credits

Department: Informatics

Course Status: Elective course in curriculum of major Informatics. Bachelor degree.

Course description: The course is introduction in nonparametric statistic and possibility to apply new 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- 30%
- Final Test- 70%

The course is successful completed with at least 65% of all scores.

Registration for the Course: required

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

WEB-BASED EXPERT SYSTEMS

Semester: 7 semester

Type of Course: lectures and labs

Hours per week: 2 lectures + 2 labs per week

Credits Numbers: 6,0

Department: Informatics

Course Status: Fundamental course from the Computer Science Bachelor Curriculum.

Course description: Artificial Intelligence has come out of the closets of the scientists and has found increasing application in the engineering and business world. The concept of engineering of knowledge has only recently come under discussion. Principles of engineering have been applied to the planning and development of software, i.e. software engineering has evolved as a discipline in computer science that uses such methods as analysis of requirements, specifications, planning and modular design, prototyping, and implementing the design in appropriate programming languages, and finally, operational application. This course develops two parallel approaches to knowledge engineering: For one, the lecture is designed to discuss the fundamentals of artificial intelligence as it applies to knowledge engineering and the development of expert systems and web-based expert systems. The second part of this course is devoted to the practical web-based application of the concepts: The students will learn to develop mini web-based expert systems of their choice that will incorporate the concepts of expert systems and the techniques of knowledge engineering to assist practitioners in different fields (e.g. auto mechanic, medical doctors, etc.) in diagnosing malfunctions and/or projecting potential solutions to problem.
This course presents an in-depth examination of web-based expert or knowledge-based systems. Topics to be covered include architectures, knowledge representation structures, building techniques, and design tools and shells for constructing web-based expert systems; the life-cycle

of web-based expert systems; and evaluating web-based expert systems. Details of specific web-based expert systems and web-based expert system shells will be covered.

Basic objectives and tasks:
The main objective of this course is to provide the students with an understanding of the principles of knowledge engineering and the design and development, planning, and management of a web-based expert system.

1. To explain what Web-Based Expert System (ES) is: Definition, history, and general concept; Characteristic, advantages and limitations; Types and examples; Architecture and components; Development process; Inference engine; Knowledge base; Uncertainty factor; Knowledge acquisition; Web-based expert system's development tools
2. To give students opportunity to be creative on applying their ability by developing an WBES. There will be a final task completed in a group

Methods of teaching: lectures, projects, other methods

Pre-requirements: Basic knowledge in Foundation of informatics, Mathematical Logic, and Programming languages.

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. Jackson, P. Introduction to Expert Systems (3rd ed.). Addison-Wesley, 1998
2. Russell, S., P. Norvig. Artificial Intelligence: A Modern Approach (3rd ed.). Pearson Education Ltd., 2010.
3. Joseph C. Giarratano, Gary D. Riley, Expert Systems: Principles and Programming, Course Technology, 2005.
4. Y. Duan, J. S. Edwards, M. X. Xu, "Web-based expert systems: benefits and challenges", Information &Management, Volume 42(6), 2005, 799811.
5. E. J. Friedman-Hill, JESS, Java Expert System Shell, Sandia Nation Laboratories, Livermore, CA, http://herzberg.ca.sandia.gov/jess

NUMERICAL OPTIMIZATION

Semester: 7 semester

Course Type: lectures and lab exercises

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

ECTS Credits: 6 credits

Department: Informatics, telephone: 073 / 588 532

Course Status: Optional Course in the Information Systems and Technologies B.S. Curriculum

Course Description: The course in Numerical Optimization includes basic numerical methods for solving various classes of optimization problems: line search methods – dichotomous search, golden section method, Fibonacci search, Newton's method; unconstrained optimization methods – nongradient methods (cyclic coordination method, method of Hooke and Jeeves, method of Rosenbrock), gradient methods (steepest descent method), methods of second order (Newton's method, modifications), as well as conjugate directions methods (conjugate gradients method: method of Fletcher-Reeves, method of Polak-Ribiere; quasi-Newton methods: method of Davidon-Fletcher-Powell); constrained optimization – methods of feasible directions (of Zoutendijk, of Rosen, of Wolfe [of the reduced gradient]), penalty and barrier functions methods; nonsmooth analysis and methods for nondifferentiable (nonsmooth) optimization; stochastic programming; separable programming; dynamic programming; vector (multi-objective) optimization and Pareto optimality.

Course Objectives: Student should obtain knowledge and skills for numerical solution of optimization problems.

Teaching Methods: lectures and lab exercises

Requirements/Prerequisites: Basic knowledge in Mathematical analysis, Linear algebra, Analytic geometry, Mathematical programming.

Assessment: written final exam on two topics (grade weight is 60 %); two homework projects (grade weight is 40 %)

Registration for the Course: by request at the end of the previous academic year

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

References:

Basic Titles:

1. Yu. P. Zaichenko – "Operations Research", Higher School, Kiev, 1988 (in Russian).
2. V.G. Karmanov – "Mathematical Programming", Nauka, Moscow, 1986 (in Russian).
3. Stefan M. Stefanov – "Quantitative Methods of Management", Heron Press, 2003 (in Bulgarian).

Additional Titles:

1. M. S. Bazaraa, H. D. Sherali and C. M. Shetty – "Nonlinear Programming. Theory and Algorithms", John Wiley & Sons, Inc., New York, 3-rd ed., 2008.
2. R. Fletcher – "Practical Methods of Optimization", 2-nd ed.q John Wiley & Sons, Chichester-New York-Brisbane-Toronto-Singapore, 2003.
3. Jorge Nocedal, Stephen Wright – "Numerical Optimization", 2-nd ed., Springer, 2008.

4. Stefan M. Stefanov – "Separable Programming. Theory and Methods", Springer-Verlag, Berlin, 2010.

Abbreviation:

FS: Fall Semester

SS: Spring Semester

OBJECT-ORIENTED AND DISTRIBUTED DATABASES

Semester: 7 semester

Type of Course: lectures and tutorials in computer lab

Hours per week: 2 hours lecture and 2 hours tutorials in computer lab/ autumn semester

Credits Numbers: 6 credits

Department: Informatics

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

Course description: This course is an introduction to methods for developing object-oriented and distributed databases by means of object-oriented environments for Visual design and event-oriented programming. It discusses the various aspects of the design of distributed databases and the use of various objects: datasets, objects of type "field" controls bound to data, etc. Developed various applications for data access depending on their architecture: object-oriented and distributed (client/application server/server). Study the various data access technologies such as ADO, dbExpress, IBExpress, ADO.NET, DataSnap, Cloud applications, etc.

Course Objectives This course aims to provide students with knowledge and additional training in the development of object-oriented and distributed databases and methods of their use.

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

Requirements: Needed basic knowledge of databases (core course), database systems and object-oriented programming.

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. Embarcadero Technologies. Developing Database Applications: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site. 2020.
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:

FS: Fall Semester

MULTIMEDIA DATABASES

Semester: 7th semester

Course Type: lectures, lab exercises

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

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Optional Course in Bachelor of Science Curriculum of Information Systems and Technologies.

Course Description: The course acquaints students with multimedia systems and multimedia databases, and various formats for multimedia data. Various elements of multimedia: the presentation of sound, text, images and graphics, animation and video. Studied data structures, models and multimedia data management systems databases. Internet is seen as a medium for distributed multimedia databases.

Course Objectives: The aim of the course is for students to gain an idea of basic concepts, objects and some basic theoretical results in the media, the ways in which multimedia objects are structured and can be described.
After completion of the course students should be able to:

- design effective and quality multimedia products.
- teamwork.

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

Requirements/Prerequisites: Needed basic knowledge of information technology and databases. Desirable Knowledge of programming languages C + +, ObjectPascal and / or 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 coursework (30% of final grade). Course ends with a written exam on the material according to the attached syllabus (70% 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. Ian H. Witten, David Bainbridge, David M. Nichols (2009) *Multimedia Information and Systems: How to Build a Digital Library*, Morgan Kaufmann Publishing
2. Steve Heath (2017) *Multimedia and Communications Technology*, 2nd Edition, Focal Press
3. K. Selçuk Candan and Maria Luisa Sapino (2010) *Data Management for Multimedia Retrieval*, Cambridge University Press
4. Raphael Troncy, Benoit Huet, Simon Schenk (2011) *Multimedia Semantics: Metadata, Analysis and Interaction*, Publisher Wiley, USA
5. Marcelle Kratochvil (2013) *Managing Multimedia and Unstructured Data in the Oracle Database: A revolutionary approach to understanding, managing, and delivering digital objects, assets, and all types of data*, Packt Publishing, UK
6. Steve Heath (2017) Multimedia and Communications Technology, 2nd Edition, Focal Press.
7. Peter Brinkmann (2012) *Making Musical Apps: Real-time audio synthesis on Android and iOS*, O'Reilly Media, USA
8. Elizabeth Keathley (2014) *Digital Asset Management: Content Architectures, Project Management, and Creating Order out of Media Chaos*, Apress Publishing, UK
9. Matthew A. Russell (2013) *Mining the Social Web, 2nd Edition: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More*, O'Reilly Media, English
10. Dan Zarrella (2009) The Social Media Marketing Book, O'Reilly Media, USA

11. Anton Polinger (2011) *Developing Microsoft Media Foundation Applications*, Microsoft Press, USA
12. Olive Marsh (2017) *Multimedia Technology and Applications*, ML Books International.

Abbreviation:

FS: Fall Semester

ALGORITHMS FOR DECISION MAKING IN MANAGEMENT AND ECONOMICS

Semester: 7th semester

Course Type: lectures, lab exercises

Hours per week/SS: 2 – hours lecture and 2 – hours seminars per week/FS

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Optional Course in the Information Systems and Technologies B.S. Curriculum

INTERACTIVE MULTIMEDIA TECHNOLOGIES

Semester: 7

Hours per week: 2 lecture+2 lab

ECTS credits: 6.0

Form of assessment: on-going control and exam

Examination type: practical task, solved on computer and computer based test

Methodological guidance: Department: "Informatics", Faculty of Mathematics and Natural Sciences

Annotation: The course is proposed for students from specialties "Informatics" and "Mathematics and informatics"". The main aim of the course is students to master basic methods and technics for design, development and integration of different multimedia objects.

Outcomes:

- Students have to be able to:
- Create, edit, and integrate different multimedia objects;
- Develop multimedia content;
- Design and develop interactive educational games.

Discipline content: The course topics cover basic concepts of interactive multimedia, characteristics of authoring tools for development of interactive multimedia content. Also basic technologies for development of interactive mobile applications and virtual reality are considered. The practical implementation is related to design and development of serious games.

Technology of education and grading:
The focus of educational technology is grounded on problem based, project based and portfolio approaches. The students are supported by additional eLearning materials, published at www.e-learning.swu.bg .
Final grade consists of two grading's - on-going control and exam. On-going control is based on the student's portfolio. Exam has two parts: practical problem solving by computer and computer-based test.

Grading scale:

A. Excellent 92% - 100%	D. Satisfied 50% - 58%
B. Very Good 76% - 91%	E. Fail 0% - 50%
C. Good 59% -75%	

Literature:

1. Иванов И. Интерактивни презентации, Изд. "Обучение", София, 2010
2. Иванов И. С. Николов, Цифрови видеопродукции, Изд. "Обучение", София, 2012
3. Марков А., М. Тодорова, М. Петров, Мултимедийни технологии, Фабер, Велико Търново, 2006
4. Тодорова М, Хр. Монева, " Мултимедийни технологии", УИ „Св. св. Кирил и Методий", Велико Търново, 2006 год. ,
5. Adobe Flash Professional CS6. Официален курс на Adobe Systems
6. Audacity Manual, http://manual.audacityteam.org/o/
7. Captivate 7 Maual, helpx.adobe.com/pdf/captivate_reference.pdf
8. Technical Support VideoPad Video Editor, http://www.nchsoftware.com/videopad/support.html
9. Минковска Д., МУЛТИМЕДИЯ И ВИРТУАЛНА РЕАЛНОСТ – ПРЕДИЗВИКАТЕЛСТВО ЗА НОВИТЕ ИНЖЕНЕРНИ ТЕХНОЛОГИИ http://www.tu-sofia.bg/faculties/mf/adp/nntk_files/konf-12/Materials/NAPRAVLENIE-8/10-8-D.Minkovska.pdf
10. Interactive Multimedia, Edited by Ioannis Deliyannis, ISBN 978-953-51-0224-3, 312 pages, Publisher: InTech, 2012, URL: http://www.intechopen.com/books/interactive-multimedia
11. Inteactive Multimedia, Multimedia Production and Digital Storytelling, ED. by Dragan Cvetkovic, Published: September 25th 2019, DOI: 10.5772/intechopen.77566, ISBN: 978-1-78923-912-6, Print ISBN: 978-1-78923-911-9, eBook (PDF) ISBN: 978-1-78984-980-6,: https://www.intechopen.com/books/interactive-multimedia-multimedia-production-and-digital-storytelling

NOSQL DATABASES

Semester: 7th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 2 labs per week / WS

ECTS Credits: 6 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: With the expansion of big data processing and information storage o non-relational databases become more popular. This course aims to introduce the basics of non-relational databases and to show how they can be used in specific projects. The course will examine three main types of non-relational databases - key-valued stores, document stores, column-oriented stores. Two NoSQL databases will be introduced in deep - MongoDB and RavenDB. Cloud storages as blobs, azure tables and dynamoDB will also be introduced.

Course Aims: Students should acquire knowledge and skills to work with non-relational databases.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming, Operating Systems and Databases.

Exam: final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013
2. Dan Mccreary, Ann Kelly, Making Sense of NoSQL, Manning Publications, 2014
3. Shashank Tiwari, Professional NoSQL, Wrox, 2011
4. Christof Strauch, NoSQL Databases (http://www.christof-strauch.de/nosqldbs.pdf)
5. Eelco Plugge, Peter Membrey and Tim Hawkins, The Definitive Guide to MongoDB: The NoSQL Database for Cloud and Desktop Computing, Apress, 2010
6. David Chappell, Understanding NoSQL on Microsoft Azure, Chappell & Associates, 2014
7. http://ravendb.net/docs
8. https://foundationdb.com/documentation/
9. http://neo4j.com/developer/get-started/

10. http://hadoop.apache.org/docs/current/
11. Blob Service Concepts (https://msdn.microsoft.com/en-us/library/azure/dd179376.aspx)
12. http://cassandra.apache.org/

METADATA

Semester: 7th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 2 labs per week / WS

ECTS Credits: 6 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: The metadata can be used to facilitate the detection of the resources to annotate the contents of the database and tracking the status of resources in a collection. Important for IT specialists is to assess the role of metadata in the: administration of digital resources, security provision, data extraction and e-commerce. The course is designed to provide experience in applying metadata in practice. Covered in the course standards are Dublin Core Metadata, Resource Description Framework, and various types of microformat metadata. In addition to this will be introduced metadata in programming and their usage with Code Reflection.

Course Aims: Provide theoretical and practical background to students about the principles, standards, and tools for working with metadata.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming, Operating Systems and Databases.

Exam: final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Liu, J. (2007). Metadata and its applications in the digital library: Approaches and practices. Westport, Conn: Libraries Unlimited.

2. Baca, M. (2008). Introduction to metadata. Online Edition, Los Angeles, CA: Getty Research Institute
3. (http://www.getty.edu/research/publications/electronic_publications/intrometadata/pdf.html)
4. Intner, S. S., Lazinger, S. S., & Weihs, J. R. (2006). Metadata and its impact on libraries. Library and information science text series. Westport, Conn: Libraries Unlimited.
5. http://dublincore.org/
6. Bert Moss, Metadata in Digital Forensics, eForensics Magazine, http://www.isebahamas.com/Bert%20Moss%20eforensics%20article.pdf
7. Usama Salama, Vijay Varadharajan, and Michael Hitchens, Metadata Based Forensic Analysis of Digital Information in the Web, Annual Symposium On Information Assurance & Secure Knowledge Management, June 5-6, 2012, Albany, NY (http://www.albany.edu/iasymposium/proceedings/2012/6-Salama_Varadharajan&Hitchens.pdf)
8. Дейвид Хънтър, Програмиране с XML, SoftPress, 2001
9. Shelley Powers, Practical RDF Paperback, O'Reilly, 2003
10. MSDN (http://msdn.microsoft.com)

XML STANDARDS FOR FILE FORMATS OF MS OFFICE

Semester: 7 semester

Course Type: lectures and laboratory exercises

Hours per week FS/SS: 2 lecture hours and 2 laboratory hours per week /FS

ECTS credits: 6.0 credits

Department: Department of Informatics

Course Status: Optional Course in the Information System and Technologies B. S. Curriculum

Course Description: The course includes basics of the languages WordprocessingML, SpreadsheetML, PresentationML and DrawingML, and includes topics: introduction to Open XML, introduction to language WordprocessingML (Wordprocessing Markup Language), create electronic documents, creating a basic structure of a document WordprocessingML; wordprocessingML language capabilities for adding and formatting test, working with Tables in WordprocessingML; capabilities language WordprocessingML to work with styles, add images in WordprocessingML; capabilities language WordprocessingML formatting pages, adding custom XML text documents WordprocessingML, final layout of the document WordprocessingML; additional language options WordprocessingML; introduction to language SpreadsheetML (Spreadsheet Markup Language), key elements of a table (Spreadsheet), create worksheets (Worksheets) language SpreadsheetML; spreadsheetML options of language for working with

formulas, optimizing worksheets, spreadsheetML options of language for working with spreadsheets and pivot tables; spreadsheetML language capabilities for adding and positioning diagrams, applying styles to content, conditional formatting, worksheet charts; additional language options SpreadsheetML; introduction to language PresentationML (Presentation Markup Language), creating a basic structure of the document in PresentationML; presentationML language capabilities for working with objects (Shapes), key elements of a presentation; capabilities language PresentationML to work with Placeholders and Images (Pictures); presentationML language capabilities for working with tables and charts; introduction to language DrawingML (Drawing Markup Language), drawingML capabilities of the language for text and graphics; drawingML language capabilities for working with tables and charts. Use themes;

Course Objectives: Students should obtain fundamental knowledge and skills related to the basics of the languages WordprocessingML, SpreadsheetML, PresentationML and DrawingML.

Teaching Methods: lectures and laboratory exercises

Requirements/Prerequisites: Basic knowledge and skills for information systems and technology, as well as MS Word, MS Excel и MS PowerPoint, XML and HTML.

Assessment: written final exam

Registration for the Course: by request at the end of the previous academic year

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

References:

1. Wouter van Vugt. Open XML the Markup Explained. Microsoft Press. 2007.
2. Introduction to markup compatibility. https://msdn.microsoft.com/en-us/library/office/ ff478576.aspx. 2015.
3. Working with WordprocessingML documents. https://msdn.microsoft.com/EN-US/library/office/ gg278327.aspx. 2015.
4. Working with SpreadsheetML documents. https://msdn.microsoft.com/en-us/library/office/ gg278328.aspx. 2015.
5. Working with PresentationML documents. https://msdn.microsoft.com/en-us/library/office/ gg278318.aspx. 2015.
6. Drawing class. https://msdn.microsoft.com/en-us/library/office/documentformat.openxml.word-processing.drawing.aspx.

Abbreviation:

FS: Fall Semester
SS: Spring Semester

SOFTWARE ENGINEERING

Semester: 8th semester

Type of Course: lectures and tutorials in computer lab

Hours per week: 2 lectures and 2 lab hours per week / SS

Credits Numbers: 5,0 credits

Department: Informatics

Course Status: Compulsory Course in Bachelor of Science Curriculum of Information System and Technology.

Course description: Software engineering associate with the development of software using well-defined scientific principles, methods, and procedures. The outcome of software engineering is an efficient and reliable software product. The result of software engineering is an effective and reliable software product. The innovations observed today are the result of well-designed and quality developed software products. This course is a theoretical and practical introduction to the management of software engineering. During the lectures, the students will become acquainted with the necessary theoretical material, and during the laboratory sessions, they will apply the acquired knowledge in practical projects.

Course Objectives This course aims to provide students with knowledge of basic theoretical concepts and practical approaches related to software engineering.

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

Requirements: Needed basic knowledge of operating systems, computer programming and Data structures, object-oriented programming, databases and DBMS.

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: Not necessary.

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

References:

Basic Titles:

1. Capers Jones (2010) "Software Engineering Best Practices Lessons from Successful Projects in the Top Companies", McGraw-Hill Companies.

2. Rob Stephens (2015) "Beginning Software Engineering", Wrox.
3. John Dooley (2011) "Software Development and Professional Practice", Apress.
4. Henry H. Liu (2009) "Software Performance and Scalability. A Quantitative Approach", John Wiley & Sons, Inc.
5. Per Runeson, Martin Höst, Austen Rainer, Björn Regnell (2012) "Case Study Research in Software Engineering. Guidelines and Examples", John Wiley & Sons, Inc.
6. Stephen R. Schach (2011) "Object-Oriented and Classical Software Engineering", 8th Edition, McGraw-Hill Companies, Inc.
7. Coral Calero, Mario Piattini, Editors (2015) "Green in Software Engineering", Springer.
8. Sam Guckenheimer, Neno Loje (2012) "Agile Software Engineering with Visual Studio (Microsoft Windows Development Series)", 2nd Edition, Addison-Wesley
9. Caitlin Sadowski, Thomas Zimmermann, Editors (2019) "Rethinking Productivity in Software Engineering", Apress Open.
10. Josh Tyler (2015) "Building Great Software Engineering Teams", Apress.
11. Priyadarshi Tripathy, Kshirasagar Naik (2015) "Software evolution and maintenance: a practitioner's approach", John Wiley & Sons, Inc.
12. Olga Filipova, Rui Vilão (2018) "Software Development from A to Z: A Deep Dive into all the Roles Involved in the Creation of Software", Apress.
13. Douglas Bell (2005) "Software Engineering for Students: A Programming Approach", 4-th Edition, Addison-Wesley.
14. Simple Easy Learning (2018) "Software Engineering Tutorial: Absolute Beginners"; https://www.tutorialspoint.com/software_engineering/index.htm
15. Ronald J. Leach (2016) "Introduction to Software Engineering", 2nd Edition, CRC Press.
16. Susan Lincke (2015) "Security Planning: An Applied Approach", Springer.

Additional Titles:

1. Free ebook: Creating Mobile Apps with Xamarin.Forms; https://blogs.msdn.microsoft.com/microsoft_press/2016/03/31/free-ebook-creating-mobile-apps-with-xamarin-forms/
2. Xamarin.Forms; https://docs.microsoft.com/en-us/xamarin/xamarin-forms/
3. Xamarin; https://docs.microsoft.com/en-us/xamarin
4. Microsoft Visual Studio; https://visualstudio.microsoft.com/

Abbreviation:

SS: Spring Semester

PROTECTING INTELLECTUAL PROPERTY RIGHTS

Semester: 8 semester

Type of Course: lectures

Hours per week: 1 lecture per week

Credits Numbers: 1,5

Department: Informatics

Course Status: Compulsory course in the Information System and Technologies Bachelor of Science Curriculum.

KNOWLEDGE MANAGEMENT

Semester: 8 semester

Type of Course: lectures and labs

Hours per week: 2 lectures + 2 labs per week

Credits Numbers: 4,5

Department: Informatics

Course Status: Fundamental course from the Computer Science Bachelor 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

COMPUTER MODELS IN THE NATURAL SCIENCES

Semester: 8 semester

Course Type: lectures and seminars

Hours (weekly): 2 / 1 (WS)

ECTS Credits: 4,5

Department: Mathematics

Course Status: Compulsory course from Information systems and technologies B.C. Curriculum

Course Description: The course is adapted primarily for natural majors. The course consists of modules and mostly attractive PC-experiments of various processes in the natural sciences, colorful computer animations, graphics, drawings, formulas. For each section has selected appropriate examples and problems to exercise. possibility of changing job parameters, initial conditions, etc. . The course contains a wide range of popular topics and tasks of natural science presented by computer models in mechanics (relative motion. moment of Inertia. Elastic and Inelastic Collisions. Rocket Propulsion. Keplers Laws. Bernoullis Equation. Motion with Constant Acceleration. Weight and Weightlessness). Mechanical Oscillations and Waves. (Mechanical Waves. Transverse and Longitudinal Waves. Normal Modes of a String. Beats. Doppler Effect. Free Oscillations. Forced Oscillations). Thermodynamics and Molecular Physics (Kinetic Model of Ideal Gas. Gas Diffusion. Semipermeable Membrane. Maxwells Distribution. Brownian Motion. Isobaric, Isochoric, Isothermal. Adiabatic Process. Specific Heat of a Gas. Carnot Cycle. Evaporation and Condensation. Isotherms of a Real Gas. Thermodynamic Cycles. Work of Gas). Electric and Magnetic Field. (Motion Electromotive Force. Motion of a Charged Partcle in Magnetic Field. Mass Spectrometer. Faraday Experiments. Free Oscillations in L-R-C) . Optics. (The Spherical Mirror. The Microscope. Newton's Rings. Interference Experiment of Young. Diffraction. Fresnel's Zones. The Diffraction Grating. Circular Apertures and Resolving Power. Polarizers. Polarization of Light). Modern Physics. (The Photoelectric Effect. The Compton Scattering. The Bohr's Postulates. Standing Electron Waves on a Circular Orbit. The Wave Properties of Particles. The Electron Diffraction. The Laser. Two Levels Model. The Binding Energy of Nucleus. Relativity of Length. Relativity of Time),etc.

Course Aims: The main goal is the students to master the instruments and methods of modelling in science.

Teaching Methods: lectures, tutorials, homework, tests, etc.

Requirements/Prerequisites: Calculus I and II, Linear Algebra and Analytical Geometry.

Exam: tests, homework, final exam

Registration for the course: compulsory course

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

References:

1. http://elearning-phys.uni-sofia.bg/~gchrista/Lekcii/ - СУ, 2013
2. Fular H . R.Fular , R.Fular . Physics, S, 1988.
3. Faynman R., R. . Leyton , M.Sends . Feynman Lectures on Physics (any edition).
4. Kirkpatrick / Wheeler. Physics. A World View, 2-nd ed. 1995
5. Open Physics. MM, I,II M. 2008
6. http://mathworld.wolfram.com/LorenzAttractor.html, 2013

Abbreviation:

WS: Winter Semester

IMAGES RECOGNITION

Semester: 8 semester

Form of the course: lectures/exercises

Hours (per week): 2 lecture hours + 1 lab exercises per week, spring semester

Credits: 4, 5 credits

Department: Informatics

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

Description of the course: This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, multiview geometry including stereo, motion estimation and tracking, and classification. We'll develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment (e.g. panoramas), tracking, and action recognition. The focus of the course is to develop the intuitions and mathematics of the methods in lecture, and then to learn about the difference between theory and practice in the problem sets.

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.

Teaching Methods: lectures, seminars, discussions, practical work and homework.

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, Pattern Recognition.

Exam: course project and final exam.

Registration for the course: a request is made by students at the end of the current semester.

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

References:

1. Duda R.,Hart P.,Stork D., Pattern Classification
2. Gonzalez R., Woods R., Digital Image Processing, Third Edition, Pearson Education, Inc, 2008
3. Image Recognition and Classification. Algorithms, Systems, and Applications edited by Bahram Javidi , Copyright © 2002 by Marcel Dekker, http://www.dekker.com
4. Sonka Milan, Vaclav Hlavac, Roger Boyle, Image Processing. Analysis and Machine Vision. International Student Edition, 2008
5. Theodoridis S, K. Koutroumbas, Pattern Recognition,IV edition, Elsevier, 2009
6. Theodoridis S., A. Pikrakis, K. Koutroumbas, D. Cavouras, Introduction to Pattern Recognition. A MATLAB Approach, Academic Press, 2012
7. Theodoridis S., Koutroumbas K. Pattern Recognition. Academic Press. 1999.
8. Гонсалес Р., Вудс Р. Цифровая обработка изображений. М.: Техносфера. 2006.
9. Синягина Н., М. Тодорова; Разпознаване на образи, ISBN 978-954-680-453-2, Университетско издателство „Неофит Рилски", Благоевград, 2007
10. Форсайт Д., Понс Ж. Компьютерное зрение. Современный подход. М.: Издательский дом «Вильямс». 2004.

INTERNET TECHNOLOGIES

Semester: VIII semester

Course Type: lectures and tutorials in computer lab.

ECTS credits: 4.5 credits

Department: Informatics

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

Course Description: The course is introduction in 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), Internet Programming (core course)

Assessment:

- Project- 50%
- Final Test- 50%

The course is successful 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. Oracle Corporation, Oracle Database® Database Concepts 19c, February 2020
2. Oracle Corporation, Oracle® Application Express Application Builder User's Guide, Release 19.2, December 2019
3. Oracle Corporation, Oracle® Application Express SQL Workshop Guide, Release 19.2, December 2019
4. Oracle Corporation, Oracle® Application Express Administration Guide, Release 19.2, October 2019
5. Rick Greenwald, Beginning Oracle® Application Express, ISBN 9780470388372.

INFORMATION SECURITY

Semester: 8 semester

Course Type: lectures and lab exercises

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

ECTS Credits: 6.5 credits

Department: Informatics

Course Status: Optional Course in the Informatics B.S. Curriculum

Course Description: In the course students are introduced in present risks connected with information storage and methods for its protection from damaging and unauthorized access. Beside theoretical aspects of its protection (codes, cryptographic schemes), different tools and methods for control and protection are observed. In the course, basic principles of trusted systems, classifications and standards for estimation of trust on different classes of computer systems with respect to their protection are observed.

Course Aims: This course aim is to give students good basic knowledge in identification of possible risks and background in applying different methods of information protection.

Teaching Methods: lectures and lab exercises

Requirements/Prerequisites: Basic knowledge in Operating Systems, Computer Architectures, Probability and Statistics, Discrete Mathematics. Knowledge in Coding Theory and Cryptography is advantage.

Assessment: written final exam

Registration for the Course: by request at the end of the previous academic year

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

References:

Basic

1. Синягина, Мирчев, Дамянов, Христов, Защита на компютърната информация, Университетско издателство, 2005 г.
2. Paar, Christof and Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, Springer, 2009.
3. Дебра Шиндър, Компютърни мрежи, СофтПрес, 2003.
4. Хоумър, А., Д.Съсман, Бр. Брансис и др., Професионално програмиране с Active Server Pages 3.0, СофтПрес, 2001.
5. Кастането, Х., Х.Роаст и др., Професионално програмиране с PHP, СофтПрес, 2001.
6. Бойваленков, П., http://www.moi.math.bas.bg/~peter.
7. Department of Defense Trusted Computer System Evaluation Criteria, DoD 5200.28-STD.
8. Уикипедия - Интернет енциклопедия, http://www.wikipedia.org.
9. Howard, M., D. LeBlanc, Writing Secure Code, Microsoft Press, 2002.
10. Network Associates, Inc. An introduction to cryptography, 1998.
11. Bagnall, B., C.Broomes, R.Russell, E-mail Virus Protection Handbook, Syngress Publishing, 2000.
12. Dunsmore, B., J.W. Brown, M.Cross, Mission Critical! Internet Security, Syngress Publishing, 2001
13. Ludwig, M., The little black book of computer viruses, Eagle Publications, Inc. 1996.
14. Ed Bott, C. Siechert, Microsoft Windows Security Inside Out for Windows XP and 2000, Microsoft Press, 2003, http://www.avp.ch
15. Pfleeger.Ch., S.L.Pfleeger, Security in Computing, Third Edition,Prentice Hall PTR, 2002

Additional

1. http://turinq.une.edu.au/~comp290/
2. Smith, B., B. Komar, Microsoft Windows Security Resource Kit, Microsoft Corp., 2003
3. Bishop, M. Computer Security: Art and Science, Addison Wesley Professional, 2003
4. Кпандер, Л, Защита от Хакери, София, 1999
5. Скамбрей, Д., МакКпър, С., Къртс, Д., Защита от хакерски атаки, София, 2001
6. Хеч, Б., Пий, Д., Курц, Д., Защита от хакерски атаки за Linux, София, 2001
7. Garfinkel, S., Spafford, G., Practical UNIX and Internet Security, O'Reilly, 1996

8. Zwicky, E., Coopers, S., Chapman, D., Building Internet Firewalls, O'Reilly, 2000, http://www.all.net
9. Thompson K., Reflections on Trusting Trust, Communication of the ACM, Vol. 11. No. 8, August 1984, pp. 761-763, Association for Computing Machinery, Inc.

Abbreviation:

SS: Spring Semester

DEVELOPING DATABASE APPLICATION

Semester: 8th semester

Course Type: lectures and laboratory exercises

Hours per week FS/SS: 1 lecture hour and 2 laboratory hours per week /SS

ECTS credits: 4.5 credits

Department: Department of Informatics

Course Status: Optional Course in the Information System and Technologies B. S. Curriculum

Course Description: The course includes basic methods in database application development and related topics: designing applications for working with databases; use of data sets; use of data fields; working with standard controls on data; working with advanced controls for data; working with unidirectional datasets, technology overview dbExpress; using client datasets; create applications to work with databases using technology ADO; create applications to work with databases using technology BDE; methods for transforming existing BDE applications to applications based on newer technologies; using XML in applications for working with databases; export information from database applications to CSV and HTML formats; export information from database applications to MS Excel; analyzing information in applications for working with databases; creating reports in applications for working with databases.

Course Objectives: Students should obtain basic knowledge and skills for developing databases applications.

Teaching Methods: lectures and laboratory exercises

Requirements/Prerequisites: Basic knowledge and skills for databases, database management systems and programming.

Assessment: written final exam

Registration for the Course: by request at the end of the previous academic year

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

References:

1. Embarcadero Technologies. (2015). Developing Database Applications: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site:
2. Marco Cantu. (2003). Mastering Delphi 7. Publisher Sybex
3. Marco Cantu. (2005). Mastering Borland Delphi 2005. Publisher Sybex
4. Marco Cantu. (2010). Delphi 2010 Handbook: A Guide to the New Features of Delphi
5. Embarcadero Technologies. (2015). FireDAC: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site:
6. Андрей Сорокин. (2005). Delphi разработка баз данных. Издателство: Питер.
7. Eric Harmon. (2001). Delphi/Kylix Database Development. Publisher Sams
8. Ivan Hladni. (2006). Inside Delphi. Publisher Wordware Publishing
9. David M. Kroenke, David Auer. (2012). Database Concepts (6th Edition). Publisher Prentice Hall, USA
10. Carlos Coronel, Steven Morris, Peter Rob. (2012). Database Systems: Design, Implementation, and Management. Publisher Cengage Learning, USA

Abbreviation:

FS: Fall Semester

SS: Spring Semester

INFORMATION RETRIEVAL AND WEB SEARCH

Semester: 8th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 1 lab per week / SS

ECTS Credits: 4,5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: This course provide summary on databases, NoSQL databases, metadata, and through skillful application of domain specific languages to consider actions for data analysis and data mining. Discussed are topics related to processing of large data storage, search on the web, indexing information using Solr, crawl and collect information on the web. The course will also address developments of search engines. Additionally, will be discussed options of knowledge extraction with ontologies and algorithms for patterns recognition.

Course Aims: Provide specialized training for analyzing data, generation of indexes, creation of modules for site search and tools to crawl and collect information.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming, Operating Systems and Databases.

Exam: final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Stefano Ceri at al., Web Information Retrieval, Springer-Verlag, 2013
2. Peter Morville and Jeffery Callender, Search Patterns, O'Reilly Media, Inc.,2010
3. Rafal Kuc, Apache Solr 4 Cookbook, Packt Publishing, 2013
4. J. Cho, N. Shivakumar, H. Garcia-Molina. Finding replicated web collections. ACM SIGMOD Record, Vol. 29, No. 2, pp. 355-366, 2000.
5. S. Chakrabarti, B. Dom, D. Gibson, J. Kleinberg, S.R. Kumar, P. Raghavan, S. Rajagopalan, A. Tomkins, Hypersearching the Web. Scientific American, June 1999.
6. S. Brin, L. Page. The anatomy of a large-scale hypertextual Web search engine. Computer Networks and ISDN Systems. Vol. 30, No. 1-7, pp. 107-117, 1998.

METHODS AND TOOLS FOR COMPUTER SYSTEMS INTEGRATION

Semester: 8th semester

Course Type: lectures and labs

Hours (weekly)/WS/SS: 2 lectures and 1 lab per week / SS

ECTS Credits: 4.5 credits

Department: Department of Computer Science

Course Status: Optional course from the Computer Systems and Technologies Bachelor Curriculum.

Short Description: Modern development of information services for organizations suggests gradual development of information systems and their integration. The course offers an overview of the different architectures - based on common parts and service-oriented. Discussed are types of systems in the IT infrastructure of the organization such as passive and active systems, homogeneous and heterogeneous systems. The main topics are related to methods for systems integration: through common databases, messages, and Web services.

Course Aims: To extend training of IT specialists in the integration and administration of various information computer systems.

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

Requirements/Prerequisites: Knowledge in Programming Basics, Object Oriented Programming, Databases, Operating Systems, Networking, Internet Programming

Exam: Final exam

Course enrolment: Students should submit an application at the academic affairs department at the end of the current semester

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

References:

1. Microsoft, Pattern and Practice, Integration Patterns, 2004 (http://download.microsoft.com/download/a/c/f/acf079ca-670e-4942-8a53-e587a0959d75/intpatt.pdf)
2. Marcin Kawalerowicz, Craig Berntson, Continuous Integration in .NET, Manning, 2011
3. Carl Jones, Do More with SOA Integration, Packt Publishing, 2011
4. http://www.enterpriseintegrationpatterns.com/
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