QUALIFICATION PROFILE
Major field of study: "COMPUTER SCIENCE"
Degree: "Bachelor of Science"
Professional qualification: "COMPUTER SCIENTIST"

The field of study "Informatics" 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). Bachelor students of Informatics obtain professional qualification "Informatician". The bachelor's program corresponds to the developed Professional Qualification Framework in the European Education Area. It outlines in detail the level of knowledge and skills of the graduates, as well as their suitability to cope with tasks of varying complexity. The specialty Informatics is theoretically and practically oriented. The curriculum includes compulsory basic subjects providing basic multi-disciplinary training in the field of informatics. Through optional courses, students could choose and enrich their knowledge and practical skills for specific areas of informatics.

Practices and internships

In the laboratories of the department, practical lessons are held, which are included in the curriculum laboratory exercises for the compulsory and optional subjects. Students can participate in the annually organized additional internships and practices in companies.

REQUIREMENTS FOR THE PROFESSIONAL QUALITIES AND COMPETENCIES OF ADMITTED STUDENTS

Individuals who have completed secondary education or have a bachelor's/master's degree in other specialties can apply for training in the specialty.

REQUIREMENTS FOR THE PROFESSIONAL QUALITIES AND COMPETENCIES OF GRADUATES OF THE SPECIALTY

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.

The Bachelor's program prepares specialists who improve their knowledge in the field of information systems and technologies, upgrade and expand the acquired knowledge and skills, which are the basis for developing and implementing new ideas. In the learning process, students gain in-depth knowledge in the field of informatics and computer science, the use of various software products, design, development and implementation of software products for various fields of application.

Learning highlights: Programming; Modern Data Processing Technology; Web Application Development; Security and Protection of Information; Software Project Development Technology.

Bachelor of Informatics students acquire knowledge and skills such as*:*

- good theoretical training in the field of informatics and mathematics and solid practical-applied knowledge.
- professional qualities, giving them the opportunity for adaptation and affinity to the rapidly changing requirements of the information society.
- an opportunity to successfully continue education in higher educational and qualification degrees (master's and doctor's) in the country and abroad.

Successful bachelor graduates can work effectively both independently and in a team. They can realize themselves as managers with in-depth analytical knowledge and skills in the various levels of management in the field of informatics.

After completion of Bachelor of Science (BSc) degree in Informatics, they can successfully realize themselves as: Coordinator of IT projects; Lecturers in higher schools; Information technology systems analyst; Developer team leaders; Database management systems programmers; Database administrators; Web designers; Expert -security of information and communication technologies, information assurance; Developer of websites, software applications, business management systems; Specialist in data processing, computer crimes, data security; Web site administrator

REQUIREMENTS TO PREPARATION OF STUDENTS COMPLETING THIS MAJOR FIELD OF STUDY

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

- 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 economic, engineering and management problems in continuous and discrete macro systems.
- to solve various optimization problems.
- to use computer systems for automating the production process and management.

The qualification characterization of the major field of study "Informatics" for BSc degree, with professional qualification "Informatician", is a basic document that determines rules for developing the curriculum. This qualification characterization is conformed with legislation in the area of higher education in 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 June 10, 2008, Protocol No 16.

- The Faculty Council of the Faculty of Natural Sciences and mathematics held on July 03, 2008, Protocol No 6.
- The Academic Council of South-West University "Neofit Rilski" of July 09, 2008, Protocol No 8.

The qualifying characteristic is updated and accepted at a session of the Informatics Department Council held on April 26, 2021, Protocol No 4.

Head of Department:

/Associate Professor Irena Atanasova, PhD/

The qualifying characteristic is accepted at a session of the Faculty Council of the Faculty of Natural Sciences and mathematics held on April 27, 2021, Protocol No 5.

Dean:

/Associate Professor Elena Karastranova, PhD/

The qualifying characteristic is accepted at a session of the Academic Council of South-West University "Neofit Rilski" of July 07, 2021, Protocol No 15.

CURRICULUM

FIELD OF STUDY: COMPUTER SCIENCE
DURATION OF STUDY: 4 YEARS (8 SEMESTERS),
DEGREE: BACHELOR OF COMPUTER SCIENCE

First Year			
I semester	**ECTS Credits**	**II semester**	**ECTS Credits**
Compulsory courses		**Compulsory courses**	
Computer mathematics 1	6.0	Databases	6.0
Computer graphic	6.0	Computer mathematics 2	6.0
Introduction in programming	6.0	Languages and programming environments	6.0
Introduction in information systems and technologies	6.0	Object-oriented programming	6.0
		Web design	6.0
English language 1	6.0	Sport	0.0
Sport	0.0		
Total:	**30**	**Total:**	**30**

Second Year			
III semester	**ECTS Credits**	**IV semester**	**ECTS Credits**
Compulsory courses		**Compulsory courses**	
English language 2	6.0	Mathematical logic	6.0
Programming and data structures	6.0	Operation systems	6.0
Functional programming	6.0	Logic programming	6.0
Algorithms in graphs	6.0	Discrete mathematics	6.0
Optional course 1	6.0	Optional course 1	6.0
Sport	0.0	Sport	0.0
Optional courses (1 Course)		**Optional courses (1 Course)**	
Computer mathematics 3	6.0	Programming with .Net	6.0
Operational research	6.0	Graphic design of printed and promotional materials	6.0
Computer games	6.0		
Internet technologies	6.0	Virtual and augmented reality	6.0
		Programming in Python	6.0
Total:	**30**	**Total:**	**30**

Third Year			
V semester	**ECTS Credits**	**VI semester**	**ECTS Credits**
Compulsory courses		**Compulsory courses**	
Artificial intelligence	4.5	Coding theory and cryptography	6.0
Numerical analysis	6.0	Probability and statistic	6.0
Network and system administration	6.0	Mathematical optimization	6.0
Theoretical foundations of informatics	4.5	E-commerce	6.0
Computer architectures	4.5	Optional course 1	3.0
Optional course 1	4.5	Optional course 2	3.0
Optional courses (1 course)			
Software quality assurance	4.5	**Optional courses (2 courses)**	
JavaScript programming	4.5	Design and analysis of human Computer Interactions	3.0
Automata and formal languages	4.5	Project management	3.0
Domain specific languages	4.5	Norms and standards of information security	3.0
		Crises and disasters	3.0
		Protection of intellectual property	3.0
		Academic writing	3.0
Total:	**30**	**Total:**	**30**

Fourth Year			
VII semester	**ECTS Credits**	**VIII semester**	**ECTS Credits**
Compulsory courses		**Compulsory courses**	
Specialized statistical software	6.0	Software engineering	6.0
Training in IT company	6.0	Computer security	5.0
Internet programming	6.0	Optional course 1	4.5
Optional course 1	6.0	Optional course 2	4.5
Optional course 2	6.0	State exam or defense of graduate thesis.	10.0
Optional courses (2 courses)		**Optional courses (2 courses)**	
Expert systems	6.0	Text mining	4.5
Numerical optimization	6.0	Pattern recognition	4.5
Developing database application	6.0	Web content management	4.5
Mobile application development	6.0	Computer information systems	4.5
Interactive multimedia technologies	6.0		
Audio and video processing	6.0		
Mathematical models in economics	6.0		
NoSQL Databases	6.0		
Total:	**30**	**Total:**	**30**

Total credits for four academic years: **240 credits**

FIRST YEAR – I SEMESTER (COMPULSORY COURSES)

COMPUTER MATHEMATICS 1

Semester: I semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6 credits

Department: Informatics

Course Status: Compulsory Course

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

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

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

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

Registration for the Course: not necessary

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

COMPUTER GRAPHIC

Semester: I semester

Course Type: lectures and lab exercises

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

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Compulsory Course in Bachelor of Science Curriculum of Informatics

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. It is a continuation 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 on 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 are 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.

INTRODUCTION IN PROGRAMMING

Semester: I semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 2 hours lectures, and 2 hours tutorials in computer lab

Credits Numbers: 6 credits

Department: Informatics

Course Status: core course.

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

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

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

Pre - requirements: No

Assessment and Evaluation

- Project- 50%
- Final Test- 50%

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

Registration for the Course: No

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

References:

Core

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

Additional

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

On-line resources

1. URL http://dlearning.swu.bg

INTRODUCTION IN INFORMATION SYSTEMS AND TECHNOLOGIES

Semester: I semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 2 hours lectures and 2 hours tutorials in computer lab

Credits Numbers: 6,0 credits

Department: Informatics

Course Status: Core course in curriculum of major Information Systems and Technologies, bachelor's degree.

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

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

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

Pre - requirements: No (Introductory course)

Assessment and Evaluation

- Project- 50%
- Final Test- 50%

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

Registration for the Course: not required (core course)

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

References:

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

ENGLISH LANGUAGE 1

Semester: I semester

Course type: Seminars

Hours (weekly): 4 hours per week

Number of ECTS credits: 6.0

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 environments. 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

FIRST YEAR – II SEMESTER (COMPULSORY COURSES)

DATABASES

Semester: II semester

Course Type: lectures and exercises

Classes (weekly): 2 lectures and 2 exercises in computer lab

ECTS Credits: 6.0 credits

Department: Informatics

Course Status: Compulsory course from the Curriculum.

Short Description:

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

Teaching Methods: lectures, exercises, discussions.

Requirements/Prerequisites: Knowledge of Mathematics and Programming.

Exam:

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

Registration for the course: Compulsory course

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

References:

Basic

1. Записки от лекции.
2. Павел Азълов. Бази от данни. Релационен и обектен подход, техника, 1991 г.
3. Юлиана Пенева, Бази от данни. I част. София, ИК "Регалия " 6, 2003 г.
4. Ullman, J., Widom, J., DATABASE SYSTEMS The Complete Book (2rd ed), Upper Saddle River, 2009, New Jersey.
5. S. K. Singh. Sing Database Systems: Concepts, Design and Applications, 2009, Pearson India.
6. Rex Hogan. (2018) A Practical Guide to Database Design, CRC Press, USA.

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.

COMPUTER MATHEMATICS 2

Semester: II semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6 credits

Department: Informatics

Course Status: Compulsory Course

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

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

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

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

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

Registration for the Course: not necessary

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

LANGUAGES AND PROGRAMMING ENVIRONMENTS

Semester: II semester

Course Type: lectures and labs

Hours per week: 2 lecture hours and 2 labs hours per week

ECTS credits: 6.0 credits

Department: Department of Informatics

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

Course Description: The course introduces students to some of the most commonly 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 within 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: not necessary

Registration for the Exam: 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 Marc Gregoire, Van Weert Peter. C++17 Standard Library Quick Reference, 2nd Edition. A Pocket
3. 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.

OBJECT-ORIENTED PROGRAMMING

Semester: II semester

Course Type: lectures, lab exercises

Hours per week: 2 lecture hours per week and 2 labs hour per week

ECTS credits: 6 credits

Department: Informatics

Course Status: Fundamental course from the Computer Science Bachelor Curriculum

Course Description: In the course students are introduced with methods and means of Object-oriented programming The course is providing basic knowledge in development of algorithms, their programming using programming language and running and testing of the programs under certain operation system. The structure and the main operational principles of the computer systems are given. The means and accuracy of information presentation are also considered. Some of the key classes of algorithms and data structures are studied. The main techniques of the structural approach of programming and their application using C++ programming language are introduced. The aim of the course is to teach the students the techniques in the development of algorithms and programs using C++ programming language. The knowledge will be used in the general theoretical, technical and some special courses.

Course Objectives:

- Basic objectives and tasks:
    - The students give knowledge for algorithm thinking;

- to give knowledge for methods and skills in Object-oriented programming in integrated development environment for visual programming.
- To give knowledge of methods and skills in programming.
- to give knowledge for good style in programming.
- to give knowledge of basic principles when developing applications.
- Teaching Methods: lectures, tutorials, group seminars or workshops, projects, and other methods.
- Requirements/Prerequisites: The course is continued of the course "Introduction in programming".

Assessment: Evaluating the student shall be carried out on the sixth-grade scale. Current control is performed during the semester's laboratory sessions through two practical tests and one homework assignment. The course ends with a written exam on the material according to the attached syllabus. When shown a weak exam score, the student appears on the makeup exam and retains the information received from the coursework assessment.

Registration for the Course: not necessary.

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

References:

1. Майерс, Скот, По-ефективен C++: 35 начина да подобрите своите програми и проекти. София: ЗеСТ Прес. ISBN 954-9341-03-8, 2004.
2. Meyers, S., Effective C++: 55 specific ways to improve your programs and designs, 3rd Edition. Addison-Wesley Professional. ISBN 978-0321334879, 2005.
3. Meyers, S., More effective C++: 35 new ways to improve your programs and designs. Addison-Wesley Professional. ISBN 978-0201633719, 1996.
4. Overland, Brian, C++ Without Fear: A Beginner's Guide That Makes You Feel Smart, 2nd Edition. Prentice Hall. ISBN 978-0132673266, 2011.
5. Stroustrup, Bjarne, Programming: Principles and Practice Using C++, 2nd Edition. Addison-Wesley. ISBN 978-0321992789, 2014.
6. Stroustrup, Bjarne, The C++ Programming Language, 4th Edition. Addison-Wesley. ISBN 978-0321563842, 2013.
7. Reese, Richard M, Understanding and Using C Pointers. Core Techniques for Memory Management. O'Reilly Media. ISBN 978-1-4493-4418-4, 2013.
8. Vandevoorde, David; Josuttis, Nicolai M., C++ Templates: The Complete Guide. Addison-Wesley. ISBN 0201734842, 2002.

WEB DESIGN

Semester: II semester

Course Type: lecture and lab exercises

Hours per week: 2 lectures and 2 labs hours per week

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Compulsory Course in Bachelor of Science Curriculum of Informatics

Course Description: The course examines issues and techniques related to content organization and visualization on the web. Techniques for the static and dynamic pages developing and integrating them into complete websites are presented. An introduction to HTML, XHTML, and CSS is also provided. During the laboratory sessions, a website will be developed using languages and technologies as HTML, CSS, JavaScript, C# and ASP.Net MVC. This course will allow the students to develop and refine the skills to design website designs and concepts. They can study how to use the appropriate fonts on the web and how to create and process vector and raster images suitable for web content.

Course Objectives: This course aims to provide in-depth theoretical knowledge and practical abilities in the field of adaptive web design. They will study the developing methods of websites, layout, and composition of the web elements, depending on the type of device, how to publish websites and support a web server.

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 on 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 Developmen*t, 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

A. 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

17. WIPO, *The Enforcement of Intellectual Property Rights: A Case Book*, 2012; http://www.wipo.int/edocs/pubdocs/en/intproperty/791/wipo_pub_791.pdf
18. Денис Колисниченко, *HTML 5 & CSS 3 практическо програмиране за начинаещи*, изд. Асеневци, 2012
19. Жюстин Томас, *Програмиране на WEB дизайн*, изд. Нови знания, 2013
20. Алдениз Рашидов, *HTML, XHTML & CSS*, изд. Асеневци, 2012
21. Сергей Соколов, *CSS3 в примери*, изд. Асеневци, 2012

SECOND YEAR – III SEMESTER (COMPULSORY COURSES)

ENGLISH LANGUAGE 2

Semester: III semester

Course Type: seminars

Hours per week: 4 classes per week

ECTS credits: 6 credits

Department: Department of Informatics

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 its practical application in translations, essays, and 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.

PROGRAMMING AND DATA STRUCTURES

Semester: III semester

Course Type: lectures, lab exercises

Hours per week: 2 lecture hours per week and 2 labs hour per week

ECTS credits: 6 credits

Department: Informatics

Course Status: Fundamental course from the Computer Science Bachelor Curriculum

Course Description: Programming and data structures is a basic course for second-year students (third term) in the curriculum of Informatics. The main goal of the course is to master the tools and methods of the C ++ language, related to the modeling of different types of data structures. The course considers the practical aspects of implementing basic data structures using an object-oriented programming language. Some of the basic data structures covered in the course are linked lists, stacks, queues, and vectors, as well as more complex ones like binary search trees and dictionaries. It is a natural continuation of the Object-Oriented Programming course studied in the second term. The acquired knowledge is also used by other courses in informatics, programming, and databases. Students must have taken the following subjects: Introduction to Programming and Object-Oriented Programming. As a basic course in Computer science, it is necessary for the fuller mastery of many other disciplines included in the curriculum.

Course Objectives: The aim of the course is to introduce students to basic abstract data structures and their associated efficient algorithm implementations. Inheritance, templates, and exception-handling techniques are used to implement the data structures.

Teaching Methods: lectures, tutorials, group seminars or workshops, projects, and other methods.

Requirements/Prerequisites: Basic knowledge of programming and OOP.

Assessment: Evaluating the student shall be carried out on the sixth-grade scale. Current control is performed during the semester's laboratory sessions through two practical tests and two homework assignments. The course ends with a written exam on the material according to the attached syllabus. When shown a weak exam score, the student appears on the makeup exam and retains the information received from the coursework assessment.

Registration for the Course: not necessary.

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

References:

1. Кай Хорстман, Принципи на програмирането със C++, ИК Софтех, София, 2000.

2. Николай Киров, Сборник от учебни материали по Програмиране и структури от данни, Деметра, София, 2004.

3. Лендерт Амерал, Алгоритми и структури от данни в C++, ИК "Софтех", 2001.

4. Michael Goodrich, Roberto Tamassia, David M. Mount, Data Structures and Algorithms in C++, Wiley, 2004.

5. Michael Goodrich, Roberto Tamassia, David M. Mount, Data Structures and Algorithms in C++, Wiley, Second edition, 2011.

FUNCTIONAL PROGRAMMING

Semester: III semester

Type of Course: Lectures and tutorials in computer lab

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

Credits Numbers: 6,0 credits

Department: Informatics

Course Status: Compulsory.

Course description: The course introduces students to the characteristic features and theoretical foundations of functional programming. Basic constructs of functional programming languages and program structure are studied. Particular attention is paid to some specific issues such as higher-order function, deferred evaluation and working with infinite streams, etc. The basic principles of functional programming language implementation are presented. Some specific applications of these languages are considered.

Objectives:

The student should obtain knowledge of:

- Design and programming in Scheme.
- Practical aspects of functional programming.

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

Pre- requirements: C++ programming

Assessment and Evaluation

- Tutorial - 70%
- Final Test - 30%

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

Registration for the Course: not required (core course)

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

References:

1. R. Kent Dybvig / The Scheme Programming Language, Fourth Edition Copyright © 2009 The MIT Press. Electronically reproduced by permission. Illustrations © 2009 Jean-Pierre Hébert ISBN 978-0-262-51298-5 / LOC QA76.73.S34D93
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, Structure and Interpretation of Computer Programs, The MIT Press, 2 ed. 1996
3. Eisenberg, M. Programming in Scheme, MIT Press, 1990
4. Springer, G., D. Friedman. Scheme and the Art of Programming, MIT Press, 1989
5. Kurt Nørmark, Functional Programming in Scheme With Web Programming Examples, Department of Computer Science, Aalborg University, Denmark URL http://people.cs.aau.dk/~normark/prog3-03/html/notes/theme-index.html

ALGORITHMS IN GRAPHS

Semester: III semester

Course Type: lectures and labs

Hours per week: 2 lecture hours and 2 laboratory hours per week

ECTS credits: 6.0 credits

Department: Department of Informatics

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

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. 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).

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

Teaching Methods: lectures, demonstrations, problem solving.

Requirements/Prerequisites: needed basic knowledge of programming, data structures, databases, and other.

Assessment: written final exam

Registration for the Course: not necessary

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

References:

1. Nicos Christofides. Graph Theory an algorithmic approach. Academic Press, New York, London, San Francisco, 1975.
2. Wilson RJ. Introduction to graph theory, 5th ed. Prentice Hall, 2010.
3. James R. Evans, Edward Minieka. Optimization Algorithms for Networks and Graphs, 2nd Edition. New York, 1992.
4. Наков П, Добриков П. Програмиране = ++ Алгоритми. Пето издание, София, 2015.
5. Evans J., Minieka, E., Optimization Algorithms for Networks and Graphs, Second Edition,, Inc., New York and Basel, 1992.
6. Erciyes K. Guide to Graph Algorithms: Sequential, Parallel and Distributed, Springer, 2018.
7. Goldengorin B. Optimization Problems in Graph Theory, In Honor of Gregory Z. Gutin's 60th Birthday Springer International Publishing AG, 2018.
8. Ronald Gould. Graph Theory (Dover Books on Mathematics. 2012. US Cafifornia.
9. Lih-Hsing Hsu , Cheng-Kuan Lin, Graph Theory and Interconnection Networks. 1420044818;

SECOND YEAR – III SEMESTER (OPTIONAL COURSES)

COMPUTER MATHEMATICS 3

Semester: III semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6 credits

Department: Informatics

Course Status: Obligatory Course

Course Description: The course in Computer mathematics 3 includes basic mathematical methods of Analysis and Algebra, Integral and Differential Calculus. Computational mathematics (CM) is an up-to-date and useful scientific direction - a set of theoretical, algorithmic and hardware software designed for efficient computer-aided solving of mathematical problems with a high degree of visualization at every stage of the study of functions of two variables and their properties, the integral and differential calculus of functions with more variables. Goal - meaningful operation with certain formulas and use of a certain mathematical apparatus, emphasizing not the strict proofs, but the understanding of the applied operations and the use of SCM.

Aims to motivate and deepen students' knowledge of the possibilities of modern systems for computer mathematical calculations and visualization, as well as building skills for independent modeling and solving applied mathematical problems using MATLAB and open-source mathematical calculation systems, ensuring speed, clarity and practical orientation of the course.

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

Teaching Methods: lectures and exercises

Requirements/Prerequisites: Students should obtain knowledge and skills of Computer Mathematics 1 and 2, Introduction in Information Systems and Technologies, Fundamentals of Programming, Web Systems and Technologies

Assessment: two current problem tests (75%) and computer final test exam (25%).

Registration for the Course: not necessary

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

OPERATIONAL RESEARCH

Semester: V semester

Course Type: lecture

Hours per week: 2 lectures; 1 exercise week

ECTS credits: 4,5

Department: Department of Computer Science

Course Status: Optional course in Information systems and technologies.

Course Description: The aim of the research operation is quantitative analysis and finding 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:

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

COMPUTER GAMES

Semester: III semester

Course Type: seminars and laboratory exercises

Hours per week: 1 seminar hour and 3 laboratory hours per week

ECTS credits: 6.0 credits

Department: Department of Informatics

Course Status: Optional Course in Bachelor of Science Curriculum of Informatics

Course Description: The course introduces students to the C# programming language and the Unity platform, with the help of which 2D and 3D games will be developed. Also see the basic principles of video game design. Object-oriented programming is also covered.

Course Objectives: Students should obtain basic knowledge and skills for developing computer games.

Teaching Methods: seminars and laboratory exercises

Requirements/Prerequisites: Basic knowledge and skills in computer 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. Joseph Hocking (2022) "Unity in Action: Multiplatform Game Development in C#", Manning Publications
2. Harrison Ferrone (2022) "Learning C# by Developing Games with Unity", Packt Publishing
3. Paris Buttfield-Addison (2018) "Unity Game Development Cookbook", O'Reilly
4. Jeremy Gibson Bond (2022), "Introduction to Game Design, Prototyping, and Development", Addison-Wesley Professional
5. Colleen Macklin, John Sharp (2016), "Games, Design and Play: A detailed approach to iterative game design", Addison-Wesley Professional
6. Tracy Fullerton (2018), "Game Design Workshop: A Playcentric Approach to Creating Innovative Games", A K Peters
7. Jesse Schell (2019), "The Art of Game Design: A Book of Lenses", A K Peters
8. Raph Kostet (2013), "Theory of Fun for Game Design", O'Reilly

INTERNET TECHNOLOGIES

Semester: III semester

Course Type: lectures and tutorials in a computer lab.

ECTS credits: 6 credits

Department: Informatics

Course Status: An elective course in the curriculum of major Informatics, bachelor's degree.

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

Course Objectives:

The student should obtain knowledge of:

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

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

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

Assessment:

- Project- 50%
- Final Test- 50%

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

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

References:

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

SECOND YEAR – IV SEMESTER (COMPULSORY COURSES)

MATHEMATICAL LOGIC

Semester: IV semester

Course type: Lectures and seminars

Hours (weekly): lectures: 2 hours per week and seminars 2 hours per week

Number of ECTS credits: 6.0

Department: Informatics

Type of the course in the curriculum: Compulsory course from the curriculum of the "Informatics" 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.

OPERATION SYSTEMS

Semester: IV semester

Type of Course: lectures and exercises in computer lab

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

Credits Numbers: 6 credits

Department: Informatics

Course Status: Compulsory course.

Course description:

The course is an introduction in area of operation systems. Basic knowledge and skills in Linux and Microsoft Windows are covered. C programs and Bash scripts are also made for process management and file system operation. The topics of input and output organization, disk planning, file system organization a required part of any operating systems course.

Objectives:

The student should obtain knowledge of:

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

Methods of teaching: lectures, exercises, discussions.

Pre- requirements: Computer architectures, Database systems

Assessment and Evaluation

Pre-exam test – 50%

Final Test - 50%

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

Registration for the Course: Compulsory 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. Thomas Anderson, Michael Dahlin, Operating Systems: Principles and Practice, Volume 4, Amazon Media EU, United States, 2015.
3. Operating Systems: Three Easy Pieces. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau., CreateSpace Independent Publishing Platform, USA, 2020.

LOGIC PROGRAMMING

Semester: IV semester

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

Credits Numbers: 6 credits

Department: Informatics

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

Course description: The course provides an 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 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. 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. 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.

DISCRETE MATHEMATICS

Semester: IV semester

Form of the course: lectures/exercises

Hours (per week): 2 lecture hours + 2 exercises per week

Credits: 6 credits

Department: Informatics

Status of the course in the educational plan: Obligatory course in the Informatics Curriculum

Description of the course: The course is mandatory for the fourth semester for students majoring in Informatics. The discrete mathematics course is the mathematical basis of modern information technology. Builds basic knowledge related to mathematical tools and model analysis in the field of information processing, automated control systems, information and computer systems and technologies, mathematical logic, digital signal processing, etc. The course studies the basics of set theory, combinatorics, relations, functions and images, graphs, binary functions, in terms of which a very large part of the problems related to discrete objects are formulated.

Course Aims: The aim of the course in Discrete Mathematics is to acquaint students with the basic concepts and methods of sets, combinatorics, Boolean functions, relations; mastering the mathematical apparatus for solving computer science problems, forming practical habits for formalization and solving applied problems using the methods of discrete mathematics; formation of terminological and conceptual basis necessary for independent study of mathematical literature and development of logical thinking.

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

Requirements/Prerequisites: Basic knowledge in Mathematics.

Exam: The assessment from the ongoing control is shaped by two control works. Students are admitted to the exam (written final test) minimum grade average / 3.00 / from current control. The final score takes into account the results of the current control (70%) and the score from the written exam (30%).

Registration for the course: not necessary.

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

SECOND YEAR – IV SEMESTER (OPTIONAL COURSES)

PROGRAMMING WITH .NET

Semester: IV semester

Course Type: lectures and labs

Hours (weekly): 2 lecture and 2 labs per week

ECTS Credits: 6 credits

Course Status: Optional course from the Informatics Bachelor Curriculum.

Short Description: This course observes .NET software development framework. The main topics included in this course are: .Net overall architecture, CLR, CTS, lambda expressions, data access – EF/LINQ, processing XML, WinForms, WPF, MAUI. Reflection, asynchronous and parallel programming and synchronization also will be addressed.

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 apply 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. Microsoft Developers Documentation. https://docs.microsoft.com/en-us/ (online)
9. Microsoft, Creating Mobile Apps with Xamarin.Forms (online) 2018
10. Andrew Troelsen, C# and the .NET Platform (Intertech Instructor Series), APress L. P., 2001, 970 pages, ISBN: 1893115593
11. Jesse Liberty, Programming C#, 2nd Edition, O'Reilly & Associates, Inc., 2002, 648 pages, ISBN: 0596003099
12. Michael Stiefel and Robert J. Oberg, Application Development Using C# and .NET, Pearson Education, 2001, 656 pages, ISBN: 013093383X

GRAPHIC DESIGN OF PRINTED AND PROMOTIONAL MATERIALS

Semester: IV semester

Course Type: lecture and lab exercises

Hours per week: 2 lecture hours and 2 lab hours per week

ECTS credits: 6.0 credits

Department: Informatics.

Course Status: Optional Course in 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 purposes.

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 on 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 are 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 the 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

VIRTUAL AND AUGMENTED REALITY

Semester: IV semester

Course Type: lecture and lab exercises

Hours per week: 2 lecture hours and 2 lab hours per week

ECTS credits: 6.0 credits

Department: Informatics.

Course Status: Optional Course in Bachelor of Science Curriculum of Informatics

Course Description: The course presents an introduction to virtual and augmented reality, with an emphasis on the design and development of interactive virtual and augmented reality applications. The course covers the history of the field, fundamental theory, interaction techniques, and specific application areas. In the context of virtual and augmented reality, some of the concepts related to computer vision, computer graphics and human-computer interaction will be introduced. Students will be tasked with creating their own virtual or augmented reality application as a course project.

Course Objectives: This course aims to provide students with knowledge and skills about the prospects and possibilities of virtual reality and augmented reality.

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

Requirements: Basic knowledge of computer graphics, computer mathematics and programming knowledge is required.

Assessment: Evaluating the student shall be carried out on 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 are 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. Jones, P., Osborne, T., Sullivan-Drage, C., Keen, N., & Gadsby, E. (2022). Virtual reality methods: A guide for researchers in the social Sciences and humanities (p. 158). Policy Press. Available online on 10-09-2023. https://library.oapen.org/viewer/web/viewer.html?file=/bitstream/handle/20.500.12657/57076/9781447360773.pdf

2. Ariso, J. M. (2017). Augmented reality: reflections on its contribution to knowledge formation. De Gruyter. Available online on 10-09-2023. https://library.oapen.org/viewer/web/viewer.html?file=/bitstream/handle/20.500.12657/31407/628401.pdf

3. Linowes, J. (2018). Unity Virtual Reality Projects: Learn Virtual Reality by Developing More Than 10 Engaging Projects with Unity 2018. Packt Publishing Ltd.

4. Cao, J., Lam, K. Y., Lee, L. H., Liu, X., Hui, P., & Su, X. (2023). Mobile augmented reality: User interfaces, frameworks, and intelligence. ACM Computing Surveys, 55(9), 1-36.

5. Grubert, J., & Grasset, R. (2013). Augmented reality for Android application development. Packt Publishing Ltd.

6. Neelakantam, S., & Pant, T. (2017). Learning web-based virtual reality: build and deploy web-based virtual reality technology. Apress.

7. Mealy, P. (2018). Virtual & augmented reality for dummies. John Wiley & Sons.

8. Fuchs, P. (2017). Virtual reality headsets-a theoretical and pragmatic approach. CRC Press.

9. Turk, M., & Fragoso, V. (2015). Computer vision for mobile augmented reality. Mobile Cloud Visual Media Computing: From Interaction to Service, 3-42.

10. Sood, R. (2012). Pro android augmented reality. Apress.

11. Kanivets, O. V., Kanivets, I. M., Kononets, N. V., Gorda, T. M., & Shmeltser, E. O. (2020). Development of mobile applications of augmented reality for projects with projection drawings.

12. Glover, J., & Linowes, J. (2019). Complete Virtual Reality and Augmented Reality Development with Unity: Leverage the power of Unity and become a pro at creating mixed reality applications. Packt Publishing Ltd.

13. Linowes, J. (2018). Unity Virtual Reality Projects: Learn Virtual Reality by Developing More Than 10 Engaging Projects with Unity 2018. Packt Publishing Ltd.

14. Okita, A. (2019). Learning C# programming with Unity 3D. AK Peters/CRC Press.

15. Taylor, A. G. (2016). Develop Microsoft HoloLens apps now (pp. 91-100). New York, NY, USA: Apress.

16. ONG., S., & Ong, S. (2021). Beginning windows mixed reality programming. Apress.

17. LaValle, S. M. (2023). Virtual Reality. Cambridge University Press.

PROGRAMMING IN PYTHON

Semester: IV semester

Type of Course: Lectures and tutorials in computer lab.

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

Credits Numbers: 4,5 credits

Department: Informatics

Course Status: elective course.

Course description: The Python Programming course will introduce students to techniques and approaches to solving programming problems using the Python programming language. The course introduces fundamental aspects of Python programming such as numeric and string data types, operators, expressions, control structures, functions, methods, objects, and classes. The course also includes application of Object-Oriented Principles (OOP) in Python such as class abstraction and encapsulation, inheritance, polymorphism and exception handling. A variety of data structures are covered, including lists, tuples, sets, and dictionaries. File manipulation techniques, data format and encoding, and regular expressions are described. Using demo programs, the syntax and semantics of the Python programming language will be illustrated.

Objectives:

The student should obtain basic knowledge in the area of solving problems with Python programming language. Each student should acquire practical skills to implement basic programming techniques using the Python programming language.

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. Y.Daniel Liang, Introduction to Programming Using Python, Pearson IE, Prentice Hall, 1e, 2013.

2. Lambert K.A., Fundamentals of Python, Cengage Learning, IE, 2012.

Additional

1. http://docs.python.org/3.5/tutorial
2. www.w3resource.com
3. learnpython.org
4. www.python.org

On-line resources

1. URL *http://dlearning.swu.bg*

THIRD YEAR – V SEMESTER (COMPULSORY COURSES)

ARTIFICIAL INTELLIGENCE

Semester: V semester

Course Type: lectures and seminar exercises

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

ECTS Credits: 4.5 credits

Department: Informatics, Faculty of Mathematics and Natural Sciences

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

Course Description: The goals of Artificial Intelligence course are to present to students' theoretical background in artificial intelligence field through common terminology, approaches and formalisms; to present functional and logical paradigms and programming and to present widely known and practically used methods and algorithms which are proved their acceptance in practice. A main part of this course is the knowledge presentation and elaboration of data in both functional and logical programming languages. In this course, functional and logical programming languages constructions are discussed. Main approaches are illustrated with a rich set of decisions of practical problems in seminar exercises. Classical directions of the field of artificial intelligence are discussed: search in the state space, knowledge presentation and usage of knowledge, human computer interaction by using restricted natural language, planning of actions, computer learning and knowledge extraction, image recognition.

Course Goals: The main goals of the course are student should obtain knowledge and theoretical background about functional and logical programming and obtain practical skills in these two programming styles represented by Prolog and Scheme programming languages, respectively. Students will study classical notions and problems of artificial intelligence and some decisions and methods in artificial intelligence field.

Teaching Methods: The course uses classical forms of material presentation: lectures and seminars. The programming languages Prolog and Scheme will be used in practice for computer programming and problem decision descriptions.

Requirements/Prerequisites: Basic knowledge and experience in the following courses: Programming and Data Structures, Discrete Mathematics, Mathematical logic, etc.

Assessment: routine control 9usually 2 test-papers) and written final exam at the end of the semester.

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

NUMERICAL ANALYSIS

Semester: V semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6.0 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).

B. Boyanov – "Lectures on Numerical Analysis", Darba Publishing House, Sofia, 1995 (in Bulgarian).

4. Snezhana Gocheva-Ilieva – "Computer Numerical Analysis", Paisii Hilendarski Plovdiv University Press, Plovdiv, 2013 (in Bulgarian) (also available online).
5. Stefka Dimova, Tatiana Chernogorova, Angelina Yotova – "Numerical Methods for Differential Equations", St. Kliment Ohridski Sofia University Press, Sofia, 2010 (in Bulgarian).
6. Konstantin Kazakov – „Finite elements method for modeling building constructions", Prof. Marin Drinov Academic Press, Sofia, 2010 (in Bulgarian).
7. M. Kaschiev – "Numerical Analysis Handbook", Martilen Publishing House, Sofia, 1994 (in Bulgarian).
8. "Numerical Analysis Problem Book", 2-nd ed., St. Kliment Ohridski Sofia University Press, Sofia, 1994 (in Bulgarian).
9. V. Pasheva – "Introduction to Numerical Analysis", Technical University-Sofia, 2009.
10. 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).

NETWORK AND SYSTEM ADMINISTRATION

Semester: V semester

Course Type: lectures and labs

Hours (weekly): 2 lecture and 2 labs per week

ECTS Credits: 6 credits

Course Status: Compulsory course from the Informatics Bachelor Curriculum.

Course Description:

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. Олаф Кирх, Тери Доусън Linux Network Administrator's Guide, 2001
5. Алдениз Рашидов. Инсталиране и конфигуриране на Web сървъри под Linux и Windows (2012)
6. Генчо Стоицов, Компютърни мрежи и комуникации, ПУ, 2013 (http://kmk.fmi-plovdiv.org/LecturesKMK.pdf)
7. Делян Генков, Основи на компютърните мрежи, ТУ Габрово, 2014 (http://delian.genkovi.com/netbook/NetBookDGenkov.pdf)
8. Иван Цонев, Компютърни мрежи, ШУ, 2013 (http://shu.bg/tadmin/upload/storage/2202.pdf)
9. Александър Милев, Компютърни мрежи и комуникации, ШУ (http://info.fmi.shu-bg.net/skin/tfiles/milev_%D0%9A%D0%9C%D0%9A.pdf)
10. Александър Милев, Борислав Найденов, Администриране на мрежи, ШУ, 2010 (http://info.fmi.shu-bg.net/skin/pfiles/administration_book.pdf)
11. Боровска П., Компютърни системи. София, Сиела, 2010 г.
12. Боянов. К. и кол. Компютърни мрежи. Интернет, София, НБУ, 2003.

13. Гриша Спасов, Николай Каканаков, Митко Шопов, Ръководство за лабораторни упражнения по компютърни мрежи, ТУ София

14. Алдениз Рашидов. Инсталиране и конфигуриране на Web сървъри под Linux и Windows (2012)

15. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов (2005) Защита на компютърната информация Университетско Издателство "Неофит Рилски", Благоевград, ISBN 954-680-345-6, COBISS.BG-ID – 1043270116

16. VirtualBox User Manual – безплатна книга - http://download.virtualbox.org/virtualbox/5.0.2/UserManual.pdf

17. Jordan Krause, Mastering Windows Server 2019, Packt Publishing, 2019

THEORETICAL FOUNDATIONS OF INFORMATICS

Semester: V semester

Course type: lectures and seminars

Hours (weekly): lectures 2 hours per week and 1 hour seminar per week

Number of ECTS credits: 4.5

Department: Informatics

Type of the course in the curriculum: Compulsory course from the curriculum of the "Informatics" 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.
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.

COMPUTER ARCHITECTURES

Semester: V semester

Form of the course: Lectures/seminars

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

Credits: 4.5 credits

Department: Informatics

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 of 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

THIRD YEAR – V SEMESTER (OPTIONAL COURSES)

SOFTWARE QUALITY ASSURANCE

Semester: V semester

Course Type: lectures

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

ECTS Credits: 4.5 credits

Course Status: Elective course from the Informatics Bachelor Curriculum.

Course Description: The course is an elective program for students majoring in Informatics. The aim of the course "Quality Assurance of Software Products" is to attract students who recognize their realization as QA specialists. The course examines the role of QA in the software development process. The course covers the idea, viewing and main trends regarding the concept of quality of software development and maintenance; as well as determining the quality of the software product according to various standards. Consider different methods for testing software - White boxes, Black boxes, Gray boxes. The course discusses the principles, stages and types of testing software products. Consideration of various tools for automation of testing - UI UX testing, modular testing, as well as platforms for error tracking, preparation of a test plans and documentation of tests performed.

Course Objectives: The course aims to expand the training of students majoring in "Informatics" 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: Students should submit an application at the academic affairs department at the end of the current semester the course is compulsory

References:

1. Mauro Pezze, Michal Young, Software Testing and Analysis: Process, Principles and Techniques 1st Edition, 2008
2. Galin, Daniel, Software quality assurance, Pearson Education Limited 2004
3. Roy Osherove, The Art of Unit Testing, Second Edition with examples in C#, Manning, 2014
4. Petr Arsentev, Selenium Programming Cookbook, Exelixis Media P.C. , 2016

5. ISO, International Organization for Standardization, "ISO 9126-1:2001, Software engineering – Product quality, Part 1: Quality model", 2001.
6. Stephen Kan H. , Metrics and Models in Software Quality Engineering, 2nd Edition, AddisonWesley Professional., 2002.
7. J. Kuruvilla, JIRA 5.x Development Cookbook, Packt Publishing, 2013
8. Elfriede Dustin, Jeff Rashka, John Paul, Automated Software Testing: Introduction, Management, and Performance, Addison-Wesley Professional, 1999
9. James D. McCaffrey, Software Testing: Fundamental Principles and Essential Knowledge, 2009

JAVASCRIPT PROGRAMMING

Semester: V semester

Credits Numbers: 4,5 credits

Department: Informatics

Course Status: Elective course.

Course description: The course is an introduction to the 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: "Introduction to Computer Programming" (core course).

Assessment and Evaluation

- Project- 50%
- Final Test- 50%

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

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

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

References:

1. Flanagan, D. (2020). JavaScript: The Definitive Guide: Master the World's Most-Used Programming Language. Taiwan: O'Reilly Media.
2. Ferris, M. (2022). Brain-Friendly Tutorials To JavaScript Programming. Amazon Digital Services LLC - Kdp.
3. Stefanov, Stoyan, Object-Oriented JavaScript, Packt Publishing, 2008
4. Zakas, N., The Principles of Object-Oriented JavaScript, No Starch Press, 2014

AUTOMATA AND FORMAL LANGUAGES

Semester: V semester

Course Type: Lectures/exercises

Hours per week: 2 hours lectures +1 hours exercises per week.

ECTS Credits: 4.5 credits

Department: Informatics

Course Status: Optional course

Course Description: The Automata and Formal Languages course introduces the basics of the theory of formal languages and grammars, which is fundamental to the construction of compilers. In addition, some aspects of the theory of automata, in particular automata-recognizers, are considered. The theory of formal languages is the basis of theoretical linguistics, and generative grammars find application in formally specifying the syntax of programming languages. The use of formal languages and grammars finds application not only in programming languages, but also in document layout languages, hypertext, interface description, languages for describing distributed systems and communication protocols, etc. The basics of finite state automata theory are introduced - the concept of finite state automaton, automata recognizer, minimization of finite state automata are introduced. Algorithms for converting regular grammars and regular expressions into finite state machines are considered, a store-memory automaton is introduced as an abstract recognition machine for context-free languages. Questions related to the construction of a syntactic tree, a Turing machine and a Post machine are considered, in whose terms a large part of the tasks related to formal languages and grammars are formulated.

Teaching Methods: lectures, discussions, practical exercises.

Requirements: The students must have basic knowledge from discrete mathematics.

Assessment: permanent control during the semester (two written exams) and exam in the semester end in two parts – problems solving and answering theoretical questions. The assessment from the permanent control is shaped by two control works. Students are admitted to the exam (written final test) minimum grade average /3.00/ from permanent control. The final score takes into account the results of the permanent control (70 %) and the score from the written exam (30%).

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

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

DOMAIN SPECIFIC LANGUAGES

Semester: V semester

Course Type: lectures and labs

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

ECTS Credits: 4.5 credits

Course Status: Optional course from the Informatics 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++/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. Martin Flower's Blog http://martinflower.com
5. Aarne Ranta, Implementing Programming Languages, 2012 (online)
6. Microsoft Visual Studio Documentation. Modelling SDK (online)
7. Markus Voelter, Generic Tools, Specific Languages, 2014
8. Martin Fowler, Patterns of Enterprise Application Architecture, Addison-Wesley, 2003

9. Cay Horstmann, Object-Oriented Design and Patterns, Wiley, 2006

10. The A-Z of Programming Languages (interviews with programming language creators), Computerworld, 2008-2010

11. Shriram Krishnamurthi, Programming Languages: Application and Interpretation, Second Edition (online)

THIRD YEAR – VI SEMESTER (COMPULSORY COURSES)

CODING THEORY AND CRYPTOGRAPHY

Semester: VI semester

Course Type: Lectures/exercises

Hours per week: 2 hours lectures + 2 hours exercises per week.

ECTS credits: 6 credits

Department: Informatics

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. 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.

PROBABILITY AND STATISTIC

Semester: VI semester

Type of Course: lectures and tutorials in computer lab

Hours per week: 2 hours lectures, 2 hours tutorials in computer lab

Credits Numbers: 6.0 credits

Department: Informatics

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

MATHEMATICAL OPTIMIZATION

Semester: VI semester

Course Type: lectures and tutorials

Hours per week: 2 lecture hours and 2 tutorial hours per week

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).

E-COMMERCE

Semester: VI semester

Credits Numbers: 6 credits

Department: Informatics

Course Status: A core course in the curriculum of major IST, bachelor's degree.

Course description:

The course is an introduction to e-business and information systems.

Objectives:

The student should obtain knowledge of:

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

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

Pre-requirements: "Databases" and "Internet technologies" (core courses)

Assessment and Evaluation

- Project- 50%
- Final Test- 50%

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

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

References:

1. E-Commerce. (2020): Ajit Singh.
2. Laudon, K. C., Traver, C. G. (2020). E-commerce: Business, Technology, Society. Brazil: Pearson.
3. A Handbook on E-Commerce. (2023): Lakshyavedh Publications.
4. Essentials of E-commerce by Dr. Sandeep Srivastava Er. Meera Goyal, Er. Nishit Mathur - (English): SBPD Publications. (2020). (n.p.): SBPD Publications.
5. Moving Businesses Online and Embracing E-commerce: Impact and Opportunities Caused by COVID-19. (2021). United States: IGI Global.

THIRD YEAR – VI SEMESTER (OPTIONAL COURSES)

DESIGN AND ANALYSIS OF HUMAN COMPUTER INTERACTIONS

Semester: VI 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

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 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 the 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 resourses

1. URL http://dlearning.swu.bg

PROJECT MANAGEMENT

Semester: VI semester

Course type: lectures

Hours per week: 2 lectures hours per week

ECTS credits: 3.0 credits

Department: Informatics

Course Status: Optional Course in Bachelor of Science Curriculum of Informatics.

Course description: The Project Management course provides basic knowledge of the project planning and management for achieving the strategic goals of organizations using different types of funding, management models, staff motivation, and project stages planning. Proper planning, budgeting, risk analysis, resource allocation, stage planning, and control of the performed activity are important for the successful management of a project.

Course objectives: This course aims to provide students with knowledge of basic theoretical concepts and practical approaches related to project management.

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

Requirements: Basic knowledge of Fundamentals of Programming, Computer Architectures, and Programming Languages and Environments is 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 tasks. 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. С. Илиева, Вл. Лилов, Ил. Манова (2010) „Подходи и методи за реализация на софтуерни системи", УИ „Св. Климент Охридски", София, България.
2. J. R. Meredith, S. M. Shafer, S. J. Mantel Jr, & M. M. Sutton (2020) "Project management in practice", John Wiley & Sons.
3. Д. Кауд (2014) „Изкуството да убеждаваш. Ключови умения за мениджъри", ИК Световна библиотека, София, България.
4. Н. Стефанов (1999) „Персонален мениджмънт", ИК Присма, София България.
5. Г. Петров (2000) „Основи на финансите на фирмата", изд. Тракия-М, София, България.
6. Л. Петров (2011) Основи на счетоводството, ИК Мартилен, София.
7. Project Institute. (2017). Project manager competency development framework. Project Management Institute.
8. H. Kerzner (2017) "Project management case studies", John Wiley & Sons.
9. J. Kuster, E. Huber, R. Lippmann, A. Schmid, E. Schneider, U. Witschi, R. Wüst (2015) "Project management handbook", Springer-Verlag Berlin Heidelberg, Springer.
10. R. E. Fairley (2011) "Managing and leading software projects", John Wiley & Sons.
11. R. Burke, & S. Barron (2014) "Project management leadership. Building creative teams", John Wiley & Sons.
12. C. S. Dionisio (2018) "A project manager's book of tools and techniques", John Wiley & Sons, Inc.
13. C. G. Cobb (2015) "The project manager's guide to mastering Agile: Principles and practices for an adaptive approach", John Wiley & Sons.
14. P.M.B.O.K. Guide (2017) "A guide to the project management body of knowledge", 6th Edition, In Project Management Institute, USA.

NORMS AND STANDARDS OF INFORMATION SECURITY

Semester: VI semester

Course Type: lectures

Hours (weekly): 2 lectures per week

ECTS Credits: 3 credits

Course Status: Optional course from the Informatics Bachelor Curriculum.

Course Description: The development of e-business require 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 everyday 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. Веселина Спасова, СИГУРНОСТ ПО ДИЗАЙН В СОФТУЕРНОТО ИНЖЕНЕРСТВО, ВСУ „Черноризец Храбър“, Издателски център, 2022
2. Петко Димов, Зарко Здравков, Христина Добрева, Информационна сигурност, ВА "Г.С.Раковски", 2021
3. Веселина Спасова, Сигурност по дизайн в софтуерното инженерство, Варненски свободен университет, 2022
4. Пламен Павлов, ИНФОРМАЦИОННА СИГУРНОСТ. СТАНДАРТИ ОТ СЕРИЯТА ISO 27000 – ПЕРСПЕКТИВИ И ПРОБЛЕМИ, ACCESS Press Publishing house, 2022
5. Семерджиев Ц., Митев Н. Управление на информационната сигурност в организациите.изд. Софттрейд, 2020
6. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов, Защита на компютърната информация, УИ „Неофит Рилски“, 2005

7. НАРЕДБА за минималните изисквания за мрежова и информационна сигурност
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

CRISES AND DISASTERS

Semester: VI semester

Course Type: Seminar

Hours per week: 2 seminars hours per week

ECTS credits: 3.0 credits

Department: Informatics.

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

Course Description: Teaching in the discipline includes studying the main types of natural disasters, accidents, and mass catastrophes. The ways of managing crises of a mass nature, the means of protection, and providing first aid to injured people.

Aims of discipline: Students should learn about the main types of natural disasters, the ways to manage crises of a mass nature, and the means of protecting people, computer and other electronic systems necessary for management.

Teaching methods: Practice demonstration.

Advance conditions: Desirable on anatomy, ecology, and resources for electric truck management.

Appraisement: Written examination.

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

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

References:

Main literature:

1. Direkov, L. Protection of man and the environment under extreme conditions. 1996.
2. Simeonov, D. Catastrophic climate processes. 2012.

Additional reading:

1. Radkov, M. Saving people and providing first aid in case of fires. 2011.
2. Ivanov, I. Space-based systems for monitoring climate processes. 2010.

PROTECTION OF INTELLECTUAL PROPERTY

Semester: VI semester

Type of Course: lectures

Hours per week: 2 lecture hours per week

Credits Numbers: 3,0

Department: Informatics

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

Course description: The discipline emphasizes the legal aspects related to the protection of intellectual property. Topics related to the essence, subject and place of the protection of intellectual property in modern technological relations and law, the stages of the historical development of the protection of objects of intellectual property, as well as the various types of legal sources forming the right of intellectual property are examined. Both the subjects and the objects of intellectual property law are studied. In the lectures, attention is paid to inventions, the patents with which they are protected, copyright as a way to protect works of science, literature and art, authorship of various types of software products and databases, digitization, various networks, software, computer programs, Internet piracy and e-commerce, etc.

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

Methods of teaching: lectures, discussions

Pre- requirements: Introduction to IST

Assessment and Evaluation

- Tutorial - 70%
- Final Test - 30%

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

Registration for the Course: not required (core course)

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

References

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

ACADEMIC WRITING

Semester: VI semester

Course type: lectures

Hours per week: 2 lectures hours per week

ECTS credits: 3.0 credits

Department: Informatics.

Course Status: Optional Course in Bachelor of Science Curriculum of Informatics

Course Description: The course is an introduction to the preparation, writing and design of various types of scientific papers, such as posters and articles. The methodology of writing a bachelor thesis, which contains the formulation of the goal and objectives, collection, and processing of bibliographic information, creating a methodology and conducting research, is given the primary attention. The guidelines on the stylistic formulation of the analysis and the obtained results are included. The ways to the software design and development are discussed as part of the bachelor thesis in the Informatics and Computer Science area. The ways to presentation of the science works are explained. The correct citation and different style formatting of the science bibliography are discussed.

Course Objectives: This course aims to provide students with theoretical and practical knowledge related to academic writing.

Teaching Methods: The lectures are illustrated with presentations and practical tasks that demonstrate the way of applying the teaching material.

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

Assessment: The assessment is based on an exam test after the end of the course. During the course, the students should be doing various practical tasks, the evaluation of that participate in the final assessment.

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

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

References:

1. Върбанова, П. (2020). Как се пише? БГ Учебник.
2. Еко, У. (2013). Как се пише дипломна работа, Труд.
3. Цветкова, М. (2013). Наука със стил: писане на дипломен проект, Enthusiast.
4. Мавродиева, И., & Тишева, Й. (2014). Академично писане за докторанти и постдокторанти, унив. изд. „Св. Климент Охридски".
5. Цветкова, М. (2013). Цитирането: стандарт и стил, Библиоскоп.
6. Брезински, С. (2012). Българска реч и писмо: да говорим и пишем правилно, Изток-Запад.
7. Карнеги, Д. (2011). Изкуството да говорим пред другите, Изток-Запад.
8. Бояджиев, Т., Куцаров, И., & Пенчев, Й. (1999) Съвременен български език: Фонетика, лексикология, словообразуване, морфология, синтаксис, Изток-Запад.

FOURTH YEAR – VII SEMESTER (COMPULSORY COURSES)

SPECIALIZED STATISTICAL SOFTWARE

Semester: VII semester

Type of Course: lectures, and tutorials in computer lab

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

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 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 research.

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

TRAINING IN IT COMPANY

Semester: VII semester

ECTS Credits: 6 credits

Department: Informatics

Course Status: A core course in the curriculum of major Informatics, bachelor's degree.

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

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

Methods of teaching: Work in a real work environment.

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

Assessment: report; journal of the conducted practical training;

Registration for the Course: not required (core course)

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

INTERNET PROGRAMMING

Semester: VII semester

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

Credits Numbers: 6 credits

Department: Informatics

Course Status: A core course in the curriculum of major IST, bachelor's degree.

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

Objectives:

The student should obtain knowledge of:

- Design and programming of Internet/Intranet Web-based information systems.
- Practical aspects of JavaScript, CSS and MySQL/PHP/Apache technologies.
- Methods of teaching: lectures, tutorials, discussions, project-based method.

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

Assessment and Evaluation

Project- 50%

Final Test- 50%

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

Registration for the Course: not required (core course)

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

References:

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

FOURTH YEAR – VII SEMESTER (OPTIONAL COURSES)

EXPERT SYSTEMS

Semester: VII 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.

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

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

NUMERICAL OPTIMIZATION

Semester: VII semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6 credits

Department: Informatics

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.

DEVELOPING DATABASE APPLICATIONS

Semester: VII semester

Course Type: lectures and laboratory exercises

Hours per week: 2 lecture hours and 2 laboratory hours per week

ECTS credits: 6.0 credits

Department: Department of Informatics

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

Course Description: The course includes basic methods in database application development and related topics: database application design; use of data controls; general functions of data controls; ways to organize data; single record usage; using multiple records; view and edit data via data grid; use of composite data fields; navigating and manipulating records; use of datasets; basic methods, properties, and events of the TDataSet class; searching datasets; visualization and editing of a subset of data using filters; add, edit, delete and store records; working with batch operations; using table type datasets; using indexes to search for records; using ranges; creating master/detail relationships. work with tables; use of data fields; dynamic and persistent data fields; extended use of data fields; the basic methods of data fields; access the values of a data field; using constraints; using data fields containing objects; basics of data export; send data to other applications; analysis of information in database applications; creating reports in database applications.

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. (2021). 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. (2020). 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

MOBILE APPLICATION DEVELOPMENT

Semester: VII semester

Course Type: lectures and lab exercises

Hours per week: 2 lecture hours and 2 lab hours per week

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Optional Course in Bachelor of Science Curriculum of Informatics

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 mobile applications and will gain more practical knowledge by Android application development with Xamarin.Forms.

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: Applied to the academic department at the end of current semester.

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/

INTERACTIVE MULTIMEDIA TECHNOLOGIES

Semester: VII semester

Type of Course: Lectures and tutorials in computer lab.

Hours per week: 2 hour lectures, 2 hour tutorials in computer lab

Credits Numbers: 6 credits

Department: Informatics

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

Course description: The course is proposed for students from specialties "Informatics", „Information systems and technologies", and "Education in Mathematics, informatics, and ICT"". The main aim of the course is students to master basic methods and technics for design, development and integration of different multimedia objects.

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 interatctive mobile applications and virtual reality are considered. The practical implementation is related to design and development of serious games.

Objectives:

Students have to be able to:

- Create, edit, and integrate different multimedia objects;
- Develop multimedia content;
- Design and develop interactive educational games

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

Pre - requirements: No

Assessment and Evaluation

- Formative assessment - 50%
- Final Practical assessment- 50%

The course is successful completed with at least 51 % of all scores. In case of minimum grade 4.50 for formative assessment, students can escape the final practical assessment.

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:

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 8 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

AUDIO AND VIDEO PROCESSING

Semester: VII semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS Credits: 6 credits

Department: Informatics

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

MATHEMATICAL MODELS IN ECONOMICS

Semester: VII semester

Course Type: lectures and lab exercises

Hours per Week: 2 lecture hours and 2 lab hours per week

ECTS credits: 6

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:

1. 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.

NOSQL DATABASES

Semester: VII semester

Course Type: lectures and labs

Hours (weekly): 2 lectures and 2 labs

ECTS Credits: 6 credits

Course Status: Optional course from the Informatics 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. Azure Blob Service Concepts (https://learn.microsoft.com/en-us/rest/api/storageservices/blob-service-concepts)
12. http://cassandra.apache.org/

FOURTH YEAR – VIII SEMESTER (COMPULSORY COURSES)

SOFTWARE ENGINEERING

Semester: VIII semester

Course Type: lectures and lab exercises

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

ECTS credits: 6.0 credits

Department: Informatics

Course Status: Compulsory Course in Bachelor of Science Curriculum of Informatics

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. António Miguel Rosado da Cruz, Sara Paiva Editors (2018) "Modern Software Engineering Methodologies for Mobile and Cloud Environments", IGI Global, USA.
2. Laurent Bossavit (2015) "The Leprechauns of Software Engineering", Leanpub.
3. David J. Parker (2016) "Mastering Data Visualization with Microsoft Visio Professional 2016", Packt Publishing Inc.
4. Gregg D. Richie (2017) "Microsoft Project 2016. Microsoft Official Academic Course", WILEY.
5. Leon Starr, Andrew Mangogna, Stephen Mellor (2017) "Models to Code: With No Mysterious Gaps", Apress.

COMPUTER SECURITY

Semester: VIII semester

Course Type: lectures and labs

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

ECTS Credits: 5 credits

Course Status: Compulsory course from the Informatics Bachelor Curriculum.

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, opearating systems.

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. Нина Синягина, Иван Мирчев, Иво Дамянов, Светослав Христов, Защита на компютърната информация, УИ „Неофит Рилски", 2005
4. Zlatogor Minchev, Cyber Threats in Social Networks and Users' Response Dynamics, ЦМСО, 2012, (http://it4sec.org/article/cyber-threats-social-networks-and-users-response-dynamics)
5. Zlatogor Minchev, Cyber Threats Analysis In On-Line Social Networks With A Study On User Response, ЦМСО, 2014, (http://it4sec.org/article/cyber-threats-analysis-line-social-networks-study-user-response)

6. Ronald L. Krutz, Russell Dean Vines, Cloud Security. A comprehensive guide to secure cloud computing, Wiley, 2010
7. Христо Тужаров, 2010, Архитектура на информационната сигурност, Асеневци
8. Ст.Станев, Ст.Железов, Хр. Параскевов, Хр.Христов, Ръководство за упражнения по стеганография, Университетско издателство „Епископ Константин Преславски" Шумен, 2015
9. Цветан Семерджиев, Николай Митев. Норми и стандарти за управление на информационните системи. – София, изд. Софттрейд, 2014 г., ISBN 978-954-334-162-7
10. Himanshu Sharma, Kali Linux - An Ethical Hacker's Cookbook, Packt Publishing, 2017
11. Yuri Diogenes, Erdal Ozkaya, Cybersecurity - Attack and Defense Strategies, Packt Publishing, 2018
12. Веселина Спасова, СИГУРНОСТ ПО ДИЗАЙН В СОФТУЕРНОТО ИНЖЕНЕРСТВО, ВСУ „Черноризец Храбър", Издателски център, 2022

FOURTH YEAR – VIII SEMESTER (OPTIONAL COURSES)

TEXT MINING

Semester: VIII semester

Type of Course: Lectures and tutorials in computer lab

Hours per week: 2 hours lectures and 2 hours tutorials in computer lab

Credits Numbers: 6,0 credits

Department: Informatics

Course Status: Elective.

Course description: The course introduces concepts and methods for knowledge discovery from large amounts of text data and the application of text mining techniques for business intelligence, digital humanities, and social behavior analysis.

The main goal of this course is to increase student awareness of the power of large amounts of text data and computational methods to find patterns in large text corpora. This course is designed as an elective course for those students who are interested in text mining. Programming skill is preferred but not required in this class. This course will introduce the concepts and methods of text mining technologies rooted from machine learning, natural language processing, and statistics. This course will also show case the applications of text mining technologies in:

- information organization and access,
- business intelligence,
- social behavior analysis,
- digital humanities.

Objectives: After taking this course, the students will be able to:

- describe basic concepts and methods in text mining, for example document representation, information extraction, text classification and clustering, and topic modeling;
- use benchmark corpora, commercial and open-source text analysis and visualization tools to explore interesting patterns;
- understand conceptually the mechanism of advanced text mining algorithms for information extraction, text classification and clustering, opinion mining, and their applications in real-world problems;
- choose appropriate technologies for specific text analysis tasks and evaluate the benefit and challenges of the chosen technical solution.

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

Pre- requirements: C++ programming

Assessment and Evaluation

- Tutorial - 70%
- Final Test - 30%

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

Registration for the Course: required (elective course)

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

References

1. Weiss, S. M., Indurkhya, N., & Zhang, T. (2010). Fundamentals of predictive text mining. New York: Springer. ISBN: 978-1849962254
2. The instructor will also provide slides, tutorials, readings, sample data, and sample scripts.
3. Manning, C. D., Raghavan, P., & Schutze, H. (2008). Introduction to information retrieval, Chapters 6 and 13–18, Cambridge University Press. Available online at: http://nlp.stanford.edu/IR-book/
4. Mitchell, T. (1990). Machine learning. McGraw-Hill.
5. Severance, C. (2016). Python for everybody: Exploring data in Python 3. Online book: https://www.py4e.com/

PATTERN RECOGNITION

Semester: VIII semester

Form of the course: lectures/exercises

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

Credits: 4,5 credits

Department: Informatics

Status of the course in the educational plan: Optional course in the Informatics 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).

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

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

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

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

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

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

WEB CONTENT MANAGEMENT

Semester: VIII semester

Course Type: lectures and labs

Hours (weekly): 2 lecture and 1 lab per week

ECTS Credits: 4.5 credits

Course Status: Compulsory course from the Informatics Bachelor Curriculum.

Short Description: Modern ways creation of web content - blogs, wikis, social media require organized content management. The integration of websites with social media features and building shared content through various web services are important elements of the management of any modern website. This course covers topics related to the core technology stack in the global network, creating content strategies, content distribution strategies, analyzing and optimizing content for search engines. Topics related to marketing, branding and improving the customer experience are also partially addressed. The course examines various web technologies as well as specific content management systems (SMS) - file-based, blogging, full platforms, wikis, such as GravCMS, WordPress, BoltCMS, MediaWiki, Umbraco 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: Completed courses on Programming, Operating Systems, Networks and Systems Administration.

Exam: final exam

Enrollment for training in the discipline: according to the rules for educational activities

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

References:

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

COMPUTER INFORMATION SYSTEMS

Semester: VIII semester

Course Type: lectures and laboratory

Hours per week: 2 hours lecture and 1 laboratory hour per week

ECTS credits: 4.5 credits

Department: Department of Informatics

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

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.