

DESCRIPTION OF THE COURSE

Name of the course Fuzzy Sets and Fuzzy Logic	Code: MCSC03/04.1	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hours	Number of credits: 4

LECTURER:

Assoc. Prof. Ph.D. D. Gotseva (FKSU) – tel.: 965 2383, email: dgoceva@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Optional for the students' specialty "Computer Science and Engineering" of the Faculty of Computer Systems and Control of Technical University of Sofia – master degree.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to explain the principles of Fuzzy Sets and Fuzzy Logic. The course begins with a brief introduction to algebra of fuzzy sets, and then presents the operations on them. The course was included on the theory of fuzzy logic and its application to programming languages, theory of control, and specialized devices. Students will gain knowledge and skills for application of fuzzy logic in development of software systems and solid conceptual and practical basis for analysis and design of systems, based on fuzzy control.

DESCRIPTION OF THE COURSE: The main topics concern: Fuzzy sets and fuzzy operations, Fuzziness and probability; conceptualizing in fuzzy terms; the extension principle, Fuzzy relations and fuzzy implications; fuzzy propositions and fuzzy logic, Fuzzy rules, fuzzy inference methods, fuzzification and defuzzification, Fuzzy systems as universal approximators; Interpolation of fuzzy rules, Fuzzy information retrieval and fuzzy databases, Fuzzy expert systems, Pattern recognition and classification, fuzzy clustering, image and speech processing, Fuzzy systems for prediction, Control, monitoring, diagnosis, and planning, Optimization and decision, MATLAB Fuzzy Toolbox, FuzzyCLIPS environment and language, etc.

PREREQUISITES: Basic knowledge of Java and C++ programming languages, and mathematics are needed.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams, and course work description preparation and defence.

METHOD OF ASSESSMENT: Exam project (80%), laboratories (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. <http://dgotseva.com> – course materials. 2. Yi Cai, Ching-man Au Yeung, Ho-fung Leung, Fuzzy Computational Ontologies in Contexts: Formal Models of Knowledge Representation with Membership Degree and Typicality of Objects, and Their Applications, Springer, 2012. 3. Michael Glykas, Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications, Springer, 2010.

DESCRIPTION OF THE COURSE

Name of the course Computer vision	Code: MCSCe05	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER:

Assoc. Prof. Ph.D. Milena Lazarova (FCSC) – tel.: 965 3285, email: milaz@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for the students of specialty “Computer Science and Engineering” in the master program of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to give knowledge in the field of image analyses, pattern recognition and computerized understanding of visual images. After the end of the course the students will know different approaches, methods and algorithms for acquiring, processing and analyses of digital images and will be able to apply them in certain applications of the computer vision systems.

DESCRIPTION OF THE COURSE: The main topics covered in the course are: Hardware and information structure of computer vision system and processing hierarchy of visual information; Preprocessing of visual information. Methods for filtration of grayscale images; Gradient based edge and contour extraction; Feature detection and image segmentation; Texture based segmentation; Analyses of 3D visual scenes; Structural-linguistic recognition. Phrase-structural languages; Stereo image analyses; Principles and methods for pattern recognition; Mathematical and statistical recognition methods; Model based recognition based; Learning algorithms; Neural networks and computer vision. Multilayered neural networks; Application of the computer vision systems.

PREREQUISITES: Mathematics, Algorithms synthesis and analyses, Computer graphics, Computer architectures.

TEACHING METHODS: Lectures using video-presentation with beamer, laboratory works for 3a development, experiments, analyses and discussion on given examples and problems.

METHOD OF ASSESSMENT: Exam during the exam session with duration two academic hours, students give written answers to questions, problems or tasks (80%), laboratory works (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: Course web site: cs.tu-sofia.bg/enmoodle/course/view.php?id=82; Szeliski R., Computer Vision: Algorithms and Applications, Springer, 2011; Kaehler A., G. Bradski, Learning OpenCV: Computer Vision in C++ with the OpenCV Library, O'Reilly Media, 2014; Brahmhatt S., Practical OpenCV, Apress, 2013; Laganière R., OpenCV 2: Computer Vision Application Programming Cookbook, Packt Publishing, 2011; Prince C., Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012; Murphy K., Machine Learning: A Probabilistic Perspective, MIT Press, 2012; Forsyth D., J. Ponce, Computer Vision: A Modern Approach, Prentice Hall, 2011; Parker J., Algorithms for Image Processing and Computer Vision, Wiley, 2010; Nixon M., Feature Extraction & Image Processing for Computer Vision, Academic Press, 2012.

DESCRIPTION OF THE COURSE

Name of the course Cloud Computing and GRID	Code: MCSCe01	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER: Prof. Ph.D. Plamenka Borovska

Phone.: 965 25 24, e-mail: pborovska@tu-sofia.bg, Technical University of Sofia, Faculty of Computer Systems and Control, Department of Computer Systems and Technologies.

COURSE STATUS IN THE CURRICULUM: Compulsory for master degree students of the specialty “Computer Science and Engineering” of the Faculty of Computer Systems and Control at the Technical University of Sofia

AIMS AND OBJECTIVES OF THE COURSE: The aim of this course is to introduce students to the advanced concepts, principles, models, and technologies in Grid and Cloud computing for building distributed information services, applied in areas as: e-science, e-government, e-business, etc., according to the student’s need for high level knowledge in Grid and Cloud computing technologies. At the end of the course the students are expected to know and be able to apply the concepts, taxonomy, principles, specifics and possibilities for practical implementation of Grid and Cloud computing for developing various applications in distributed heterogeneous environment.

DESCRIPTION OF THE COURSE: The main topics concern: Grid and Cloud Computing - SaaS, PaaS, IaaS, Resource managers for Grid and Cloud Computing, Co-ordination and replication of resources. Security policy for Grid and Cloud systems. Web services, Semantic GRID, Virtual Organizations, Grid Portals, Grid and Cloud disaster recovery.

Upon completion of the course students will:

- know the concepts, principles, models and technologies for design and implementation of Grid and Cloud systems;
- be able to do a comparative analysis and assess the advantages and disadvantages between alternative solutions
- be able to create effective program implementation, assessment and analysis of the performance of Grid and Cloud Systems;

PREREQUISITES: Knowledge of Programming in Distributed Environments, Design and Analyses of Algorithms, Parallel Programming.

TEACHING METHODS: Lectures using video - presentation with beamer , laboratory works aimed at study, implementation and analyses of sample problems and case studies; course work aimed at implementation and analyses of solving certain problem by given Grid and Cloud Architecture.

METHOD OF ASSESSMENT: Exam during the exam session with duration two academic hours, students give written answers to 3 compulsory and 5 optional questions, problems or tasks (60%), laboratory works (25%), course work (15%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:

1. F. Magoules, Fundamentals of Grid Computing: Theory, Algorithms and Technologies, Chapman and Hall/CRC, 2009
2. Bill Wilder, “Cloud Architecture Patterns”, O’Reilly Media, 2012, Print ISBN: 978-1-4493-1977-9.
3. Christian Baun, Marcel Kunze, Jens Nimis, Stefan Tai, “Cloud Computing, Web-Based Dynamic IT Services”, Springer-Verlag, 2011, ISBN 978-3-642-20916-1;

DESCRIPTION OF THE COURSE

Name of the course Web Applications	Code: MCSCe02	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER:

Prof. Ognyan Nakov Nakov Ph.D. (FCSC), tel.: 965 3513, email: nakov@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory course for the students of specialty Computer Science and Engineering in the bachelor programme of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: Detailed outlook of the course's content: DHTML; script languages: JavaScript/JScript; Dynamic HTML (cascade stylesheets (CSS)); object model and collections; script and events; filters and transitions; data binding; structured graphics; implementation of Active X controls; multimedia effects; ASP (Active Server Pages) technology, basics and comparison with PHP; XML(Extensible Markup Language).

DESCRIPTION OF THE COURSE: The course introduces in modern technologies in Internet programming: JavaScript/ Jscript script language; Dynamic HTML (cascade stylesheets (CSS)); object model and collections; script guiding events; filters and transitions; data binding; structured graphics; implementation of Active X controls; multimedia effects; ASP (Active Server Pages) technology, basics and comparison with PHP; XML(Extensible Markup Language). In practice students get familiar and work with the following products apart from the given above: IE 6; InterDev 6; FrontPage; Paint Shop Pro; Web Servers - IIS, PWS.

PREREQUISITES: Basic programming knowledge.

TEACHING METHODS: Lectures in multimedia; web site with full materials of the course; laboratory work (based on instructions) and course work description preparation and defence.

METHOD OF ASSESSMENT: Exam during the exam session with duration two academic hours, students give written answers to questions from the subject.

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: Esposito, Dino. *Programming Microsoft ASP. NET MVC*. O'Reilly Media, Inc., 2011; Nixon, Robin. *Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites*. " O'Reilly Media, Inc.", 2012; Duckett, Jon. *HTML and CSS: Design and Build Websites*. John Wiley & Sons, 2011; McFarland, David Sawyer. *Javascript & jQuery: the missing manual*. " O'Reilly Media, Inc.", 2011; McFarland, David Sawyer. *CSS3: The Missing Manual*. " O'Reilly Media, Inc.", 2012; Freeman, Eric, and Elisabeth Robson. *Head First HTML5 Programming: Building Web Apps with Javascript*. " O'Reilly Media, Inc.", 2011; Purewal, Semmy. *Learning Web App Development*. " O'Reilly Media, Inc.", 2014; WEB Database Development - .NET edition, Microsoft Press, 2002.

DESCRIPTION OF THE COURSE

Name of the course Analysis and Data Management	Code: MCSCe04.2	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hours	Number of credits: 4

LECTURER:

Assoc. Prof. Ph.D. D. Gotseva (FKSU) – tel.: 965 2383, email: dgoceva@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Optional for the students' specialty "Computer Science and Engineering" of the Faculty of Computer Systems and Control of Technical University of Sofia – master degree.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to explain the principles of data analysis and management in MATLAB. The course begins with a brief introduction to programming basics. The course was included main programming structures into MATLAB and usage of them. Students will gain knowledge and skills for application of MATLAB and solid conceptual and practical basis for analysis and design of data, based on MATLAB functions.

DESCRIPTION OF THE COURSE: The main topics concern: Introduction, Programming basics, Conditionals, Nested conditionals; logical operators, Iteration: for, while, Developing algorithms; nested loops, User-defined functions, Probabilities and Averages; vectors, Simulation, Discrete vs. continuous; linear interpolation, 2-d Arrays--matrix, Working with Images, Characters and strings, working with numeric/text data (file I/O), Structures and structure arrays, Objects and Classes, Class definition--properties & methods, overloading, Array of objects, constructor that handles variable number of args, Private vs. public, Inheritance, Recursion, Sorting and Searching, etc.

PREREQUISITES: Basic knowledge of C and C++ programming languages, and mathematics are needed.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams, and course work description preparation and defence.

METHOD OF ASSESSMENT: Exam project (80%), laboratories (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. <http://dgotseva.com> – course materials. 2. *Charles F. Van Loan and K.-Y. Daisy Fan, Insight through Computing: A MATLAB Introduction to Computational Science and Engineering*, SIAM, 2010. 3. *Dr. Duane Hanselman, Mastering MATLAB*, Prentice Hall, 2011. 4. *Brian D. Hahn, Essential Matlab for Engineers and Scientists*, Academic Press, 2013.

DESCRIPTION OF THE COURSE

Name of the course: Technologies for Computer Security	Code: MCSCe04.1	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours, LW – 1 hours	Number of credits: 4

LECTURER:

Assos. Prof., PhD Roumen Trifonov (FCSC), tel.: 965 2838, e-mail: r_trifonov@tu-sofia.bg Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Free selectable subject for the students of specialty Computer Science and Engineering in the master programme of the Faculty of Computer Systems and Control at TU-Sofia.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to acquaint students with the basic principles, standards and technics in the field of technologies for computer security. This will help them in future to professionally solve tasks for choice of effective tools for protection of computer systems and networks and use in practice.

DESCRIPTION OF THE COURSE: The course discusses the problems concerning design, building and applying methods and technical tools ensuring computer security. The lectures begin with introduction to basic definitions and key futures in the field. It presents the most important politics, approaches, standards and attacks in network and information security, also the proper technics for protection of network, firewall, protected e-messages interchange, DNS, DDoS/Botnets and Web-application protection. The laboratory work helps to better rationalization of lecture material and contribute to formation of practical skills.

PREREQUISITES: Basic knowledge in informatics.

TEACHING METHODS: Lectures (with slides, multimedia projector) and additional text materials; laboratory work (based on instructions) with computer.

METHOD OF ASSESSMENT: written examination at the end of the first semester.

INSTRUCTION LANGUAGE: English.

BIBLIOGRAPHY: 1. International standards publications ISO, ITU, ETSI, etc.. - <http://www.itu.int/ITU-T/index.html> 2. ENISA information - <http://www.enisa.europa.eu/> 3. Special publications of NIST - <http://csrc.nist.gov/> 4. O. Nakov, R. Trifonov, S. Manolov, G. Popov, Computer Security, Avangard Prima 2012.

DESCRIPTION OF THE COURSE

Name of the course Semantic Web	Code: MCSCe06	Semester: 1
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER:

Asoc. Prof. Adelina Aleksieva-Petrova (FCSC) – tel.: 965 26 82, email: aaleksieva@tu-sofia.bg

COURSE STATUS IN THE CURRICULUM:

Compulsory for students speciality “Computer science and engineering” – master degree in Faculty of Computer Systems and Control of TU-Sofia.

AIMS AND OBJECTIVES OF THE COURSE:

At the end of the course the students are expected to be able to understand semantic capabilities and the status of W3C’s semantic layers - how to use RDF (Resource Definition Framework) to collaborate on shared information spaces, ontology lifecycle issues and the role ontologies play in semantic solutions and the language OWL (Web Ontology Language) and use SPARQL to query, filter and transform semantic data.

DESCRIPTION OF THE COURSE:

The Semantic Web and its technology are increasingly becoming a central element of many activities in computer science. More and more people are interested and would like to enhance their skills thereon. The course will present the cutting-edge technologies from the semantic web vision: the RDF data model; the SPARQL query language; the OWL web ontology language and Semantic Web Services.

PREREQUISITES: Object-oriented programming, some programming languages and program algorithms.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams and course work description preparation and defence.

METHOD OF ASSESSMENT: The assessment at end of semester (30%), problem solving task (50%) and laboratories (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. J. Hebel, M. Fisher, P. Blace, A. Perez-Lopez. Semantic Web Programming, Wiley, 2009. 2. Allemang D., J. Hendler, Semantic Web for the Working Ontologist, Second Edition: Effective Modeling in RDFS and OWL, Morgan Kaufmann, 2011. 3. Grigoris Antoniou, Paul Groth, Frank van Harmelen and Rinke Hoekstra, A Semantic Web Primer (Cooperative Information Systems), The MIT Press; third edition edition, 2012. 4. Colin Evans and Jamie Taylor, Programming the Semantic Web by Toby Segaran, O'Reilly Media, 2009. 5. Liyang Yu, A Developer's Guide to the Semantic Web, Springer, 2011. 6. Tom Heath, Christian Bizer and James Hendler, Linked Data (Synthesis Lectures on the Semantic Web: Theory and Technology), Morgan & Claypool Publishers, 2011. 7. Amit Sheth, Semantic Web: Ontology and Knowledge Base Enabled Tools, Services, and Applications, IGI Global, 2013. 8. Pascal Hitzler, Markus Krötzsch and Sebastian Rudolph, Foundations of Semantic Web Technologies (Chapman & Hall/CRC Textbooks in Computing), Chapman and Hall/CRC, 2009.

DESCRIPTION OF THE COURSE

Name of the course: Software Applications in e-Health	Code: MCSCe03.2	Semester: 1
Type of teaching: Lectures, Laboratory	Hours per week: L – 2 hours, LW – 1 hours	Number of credits: 4

LECTURER:

Prof. Ph.D. P. Borovska (FCSC) – tel.: 965 2524, email: pborovska@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Elective course for the students of specialty Computer Science and Engineering in the master programme of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to:

- know the main characteristics, methods and characteristics of the software applications in health care;
- know the basic structures and applications in e-Health;
- understand and to implement the fundamental algorithms and the basic operations of medical data visualization;
- acquainted with methods for solving basic problems and health care operations;
- Possess knowledge and skills to apply the implemented methods and algorithms for data processing and imaging in e-Health.

DESCRIPTION OF THE COURSE: The main topics concern: Information technologies for Health care. Software systems for e-Health. International standards for e-Health. Processing and medical imaging data. MRI. Geographic information systems for e-Health.

PREREQUISITES: Applications and systems programming, parallel programming, high-performance computer systems design and analysis of algorithms, computer graphics.

TYPE OF TEACHING: Lectures using video-presentation with beamer, laboratory works end with presentation of the results for the certain task.

METHOD OF ASSESSMENT: Exam during the exam session with duration two academic hours, students give written answers to 3 compulsory and 5 optional questions, problems or tasks (60%), laboratory works (40%).

LANGUAGES OF INSTRUCTION: English.

BIBLIOGRAPHY:

1. **E-Health Lectures:** <http://cs.tu-sofia.bg/>
2. **Upkar Varshney**, Pervasive Healthcare Computing: EMR/EHR, Wireless and Health Monitoring, ISBN: 978-1441954961, book, 2012
3. **A. K. Soman**, Cloud-Based Solutions for Healthcare IT, ISBN: 978-1405132534, book 2011
4. E-Health Portal for Europe: <http://ehtel.eu/>
5. E-Health Standards: <http://www.etsi.org/technologies-clusters/technologies/medical/ehealth>

DESCRIPTION OF THE COURSE

Name of the course: Query languages	Code: MCSCe13	Semester: 2
Type of teaching: Lectures and Laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 4

LECTURER:

Prof. Ognian Nakov Nakov Ph.D. (FCSC), – tel.: 965 3513, email: nakov@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Optional for students speciality “Computer Science and Engineering” – master degree (Faculty of Computer Systems and Control of TU-Sofia).

AIMS AND OBJECTIVES OF THE COURSE: The course represents introduction to the contemporary technology of access to structured or non structured data in local or network space. We review the SQL standard and SQL based technologies– ODBC, OLE DB, ADO, ADO.NET. Second aim of the course is passing through Microsoft licensed course: “Programming a Microsoft SQL Server Database”.

DESCRIPTION OF THE COURSE: The course represents introduction to the contemporary technology of access to structured or non structured data in local or network space. We review the SQL standard and SQL based technologies– ODBC, OLE DB, ADO, ADO.NET as well as others ways for work with databases in Internet – XML specifications with databases and directory services. (LDAP). Programming and administration of Microsoft SQL Server Database is studied as well.

PREREQUISITES: Knowledge in database fundamentals, component programming and classical programming systems.

TEACHING METHODS: Lectures in multimedia, full textual and electronic variant of SQL server programming & administration course , practical work on PC.

METHOD OF ASSESSMENT: Written examination.

INSTRUCTION LANGUAGE: English.

BIBLIOGRAPHY:

- 1.Mark McIlroy, SQL Essentials, 2009.
- 2.Zed A. Shaw, Learn SQL The Hard Way, 2011.
- 3.Stephane Faroult, SQL Success – Database Programming Proficiency, 2013.
- 4.Alan Beaulieu, Learning SQL, Amazon, 2009.
- 5.Ross Mistry, Stacia Misner, Introducing Microsoft® SQL Server® 2012, Amazon, 2012.
- 6.David Sceppa, Programming Microsoft ADO.NET 2.0, Amazon, 2006.
- 7.Julia Lerman, Programming Entity Framework: Building Data Centric Apps with the ADO.NET Entity Framework, Amazon, 2010.
- 8.<http://aws.amazon.com/rds/>.
- 9.<http://docs.aws.amazon.com/AmazonRDS/latest/GettingStartedGuide/Welcome.html>.
- 10.<http://openjpa.apache.org/>.
- 11.<http://datamart.cccco.edu/>.
- 12.The Reporting Data Mat, Borland Software, 2013

DESCRIPTION OF THE COURSE

Name of the course Software design methodologies	Code: MCSC12	Semester: 2
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hours	Number of credits: 5

LECTURER:

Assoc. Prof. Ph.D. D. Gotseva (FKSU) – tel.: 965 2383, email: dgoceva@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for the students' specialty "Computer Science and Engineering" of the Faculty of Computer Systems and Control of Technical University of Sofia – master degree.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to explain the principles of Object-oriented design and analyst (OOD/OOA) and UML usage into OOD/OOA. The students have a chance to create their own project and to pass through all stages of software life cycle.

DESCRIPTION OF THE COURSE: The main topics concern: UML characteristics, Conceptual language model, Basics blocks, terms, terms classification, Relations, Diagrams, Rules, Common mechanism, Architecture, System modeling, Software life cycle and UML, Classes, Operations, Attributes, Class responsibilities, CRC cards, Modeling system's dictionary, Modeling primitive data, Relations in UML, Modeling dependency and generalization, Common mechanism, Notes, adornments and extensibilities, Constraints, tags and stereotypes, Invariants, Modeling new blocks, new characteristic, and new semantic, Diagrams – classification, Modeling different views of the system, different level of abstraction, and complex views, Class diagrams, Modeling collaborations, and logical schemas of databases, Forward and reverse engineering, Advanced classes and relations, Classificatory, visibility and scope, template classes, standard elements, Modeling semantics of a class, Modeling multiple relations, Interfaces, types, and roles, Modeling new static and dynamic types, Packages, Modeling architectural views of the system, Use case, Use case diagrams, Modeling system requirements, Activity diagrams, Events and signals, etc.

PREREQUISITES: Basic knowledge of Java and C++ programming languages, Visual C++ environment and object-oriented programming are needed.

TEACHING METHODS: Lectures, using slides, case studies, laboratory and course work, work in teams, and course work description preparation and defence.

METHOD OF ASSESSMENT: One 1.5-hour assessment at end of semester (50%), laboratories (10%), and course work (40%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: 1. <http://dgotseva.com> – course materials. 2. Bernd Bruegge, Allen H. Dutoit, Object-oriented Software Engineering Using UML, Patterns, and Java, Pearson, 2013. 3. Norman Daoust, UML Requirements Modeling For Business Analysts, Technics Publications, LLC, 2012.

DESCRIPTION OF THE COURSE

Name of the course: Electronic Government	Code: MCSCe/10.1	Semester: 2
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours, LW – 1 hours	Number of credits: 4

LECTURER:

Assos. Prof., PhD Roumen Trifonov (FCSC), tel.: 965 2838, e-mail: r_trifonov@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Free selectable subject for the students of specialty Computer Science and Engineering in the master programme of the Faculty of Computer Systems and Control at TU-Sofia.

AIMS AND OBJECTIVES OF THE COURSE: The aim of the course is to acquaint students with different aspects of electronic governance and technologies of its implementation. The accent is on the modern tendencies in the field related to design, developing, implementing and operating of e-government systems as a ICT infrastructure with specific application.

DESCRIPTION OF THE COURSE: The course discusses the problems concerning design, building and applying methods and tools for e-governance, analysis and design of effective and secure information systems for administrative purposes and public-private relations. The lectures begin with introduction to basic definitions and key futures in the field. It presents the most important politics, approaches, standards, architectures and infrastructures for e-government – at national, regional and municipality levels, different electronic services. The laboratory work helps to better rationalization of lecture material and contribute to formation of practical skills.

PREREQUISITES: Basic knowledge in informatics.

TEACHING METHODS: Lectures (with slides, multimedia projector) and additional text materials; laboratory work (based on instructions) with computer.

METHOD OF ASSESSMENT: written examination at the end of the second semester.

INSTRUCTION LANGUAGE: English.

BIBLIOGRAPHY: 1 O. Nakov, R. Trifonov, S. others, COMPUTER SECURITY, Avangard Prima Publisher 2012;

DESCRIPTION OF THE COURSE

Name of the course Information Technologies for Business Management	Code: MCSCe10.2	Semester: 2
Type of teaching: Lectures and laboratory work Course work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 4

LECTURER:

Prof. PhD Plamenka Borovska (FCSC), тел.: 965 2524, email: pborovska@tu-sofia.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Optional for the students specialty Computer and Software Engineering MEng programme of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: After completing the course the students are expected to acquire knowledge for a wide range of information technology for business management, respectively modeling of the business processes in the enterprise; to apply the theoretical principles of analysis and design of business software systems; acquire knowledge and skills for using the business processes with the integration of IT systems and services for business purposes.

DESCRIPTION OF THE COURSE: The main topics concern: *Information technology in business* - nature, deployment, characterization, and application of management information systems; *Business processes* – management and modeling of business process and business systems; *Integrated management systems* - enterprise resource planning systems (EPR) – nature, characteristics, structure, implementation; *Marketing information systems* – nature, structure, functions and elements, marketing database; *Financial information systems* – elements, financial data, financial planning and budget, management of cash flow; *Human resource information system* – nature, structure, functions and elements; *Executive support systems (ESS)* – types, elements, users; *Decision support systems (DSS)* - types of management decisions, consumers, elements, group decision support system GDSS; *e-commerce* – categories, B2B, B2C, S2C, m-commerce; *Intelligent business systems*; *Investment risk management and portfolio optimization*.

PREREQUISITES: Programming Languages, Internet Programming.

TEACHING METHODS: Lectures, using slides, case studies, laboratory, work in teams.

METHOD OF ASSESSMENT: Two academic hour assessments. The exam consists of answers on questions and tasks.

INSTRUCTION LANGUAGE: English.

BIBLIOGRAPHY: 1. Lectures and laboratory exercises <http://cs.tu-sofia.bg> -> Information Technologies for Business Management; 2. E.Turban, L. Volonino, Information Technology Management, Wiley, 2011. 3. Kathy Schwalbe, Information Technology Project Management, Cengage Learning, 2013. 4. E.Turban, L. Volonino, Information Technology for Management: Improving Performance in the Digital Economy, Wiley, 2009. 5. M.Dhunna, J. B. Dixit, Information Technology in Business Management, Laxmi Publications, 2010.

DESCRIPTION OF THE COURSE

Name of the course Numerical Methods for Scientific Research	Code: MCSCe08	Semester: 2
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER: Prof. Ph.D. Plamenka Borovska

Phone.: 965 25 24, e-mail: pborovska@tu-sofia.bg, Technical University of Sofia, Faculty of Computer Systems and Control, Department of Computer Systems and Technologies.

COURSE STATUS IN THE CURRICULUM: Compulsory course for the students of specialty “Computer and Software Engineering” in the bachelor programme of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: The aim of this course is to introduce students to the general theory of numerical methods and the features in the design of effective implementations for solving specific classes of scientific problems. At the end of the course the students are expected to know and be able to apply the concepts, taxonomy, principles, specifics and possibilities for practical implementation of numerical methods and algorithms for development of various applications that require solving scientific problems.

DESCRIPTION OF THE COURSE: The main topics concern: Numerical methods concepts; Taxonomy ; Gauss-Jordan Elimination; LU Decomposition and Its Applications; Singular Value Decomposition; QR Decomposition; Polynomial Interpolation and Extrapolation; Cubic Spline Interpolation; Gaussian Quadratures and Orthogonal Polynomials; Multidimensional Integrals; Simple Monte Carlo Integration; Adaptive and Recursive Monte Carlo Methods; Jacobi Transformations of a Symmetric Matrix; Fast Fourier Transform; Moments of a Distribution: Mean, Variance, Skewness, and So Forth, Runge-Kutta Method, Multigrid Methods for Boundary Value Problems, Parallel Methods for Solving Linear Equation Systems, Parallel methods for solving combinatorial problems.

Upon completion of the course students will:

- know the concepts, principles, models and paradigms of numerical methods and design of the software for their implementation;
- be able to do a comparative analysis and assess the advantages and disadvantages between alternative solutions
- be able to create effective program implementation, profiling, assessment and analysis of the performance of numerical methods and algorithms;

PREREQUISITES: Knowledge of Mathematics part 1 and 2, Algorithms Synthesis and Analyses, Parallel Software Engineering.

TEACHING METHODS: Lectures using video - presentation with beamer , laboratory works aimed at study, implementation and analyses of sample problems and case studies; course work aimed at implementation and analyses of solving certain problem by given numerical method.

DESCRIPTION OF THE COURSE

Name of the course: Optimization Methods for System on Chip Design	Code: MCSCe09	Semester: 2
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hour	Number of credits: 5

LECTURER:

Assoc. Prof. Ph.D. Peter Manoilov – tel.: 0895 590 576, email: p.manoilov@mail.bg
Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for regular education of the student specialty "*Computer Science and Engineering*", Master degree, Faculty of Computer Systems and Control, Technical University-Sofia.

AIMS AND OBJECTIVES OF THE COURSE: The aim of this course is to give knowledge and skills in the area of CAD - design and implementation of high performance digital devices and systems on the contemporary VLSI (ASIC and FPGA) – chips. At the end of the course the students are expected to be able to apply the optimization methods of CAD – systems for digital design, simulation and implementation the high performance digital devices and parallel processor systems on the contemporary FPGA – chips.

DESCRIPTION OF THE COURSE: The syllabus considers the basic topics of the theory and practice of Systems on Chip (SoC) design : microelectronic technology, art of digital circuit design, logical design, parallel architectures of Systems on Chip, FPGA – architectures, hardware description languages (HDL), design methodology and optimization methods of CAD - systems for hardware and software co-design on contemporary VLSI - chips.

PREREQUISITES: Basic knowledge on microelectronics, digital circuit design, analysis and synthesis of logical devices, computer architectures, parallel algorithms, programming languages.

TEACHING METHODS: Lectures, using black/white board and slide presentations, laboratory work, using PC-based CAD systems and programmable VLSI chips on reference boards.

METHOD OF ASSESSMENT: Written exam (70%) and laboratory work (30%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY:

1. Manoilov P. – Lectures on Optimization Methods for Systems on Chip Design, Moodle, TU – Sofia, 2012.
2. Chu P. – FPGA prototyping by VHDL examples, John Wiley & Sons, 2008.
- 3 . Mano M., M. Ciletti – Digital Design with an introduction to the Verilog HDL, Prentice Hall, 2013.
4. Wolf W. - Modern VLSI Design, IP – based design, Prentice Hall, 2009.
5. Stefanov T., E. Deprettere , Marinov M., Nikolov H., Popov A. – Embedded Systems, TU – Sofia, 2012.

DESCRIPTION OF THE COURSE

Name of the course Geographic information systems	Code: MCSCe11.1	Semester: 2
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hours	Number of credits: 5

LECTURER:

Assoc. Prof. Ph.D. M. Lazarova (FCSC) – tel.: 965 3139, email: milaz@tu-sofia.bg

Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Compulsory for the students of specialty “Computer science and engineering” in the master program of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE: At the end of the course the students are expected to know and be able to implement fundamental algorithms and methods for image processing as well to use their knowledge in order to apply them in different real life problems.

DESCRIPTION OF THE COURSE: Specifics and components of a geographic information system (GIS) are discussed in the course. Special attention is given to the data models and data types for representation of geographically referenced information; the different data sources and the problems of geo-referencing of spatially distributed data; the possibilities for data visualization; the processing operations and the different type of analyses that can be applied to the geographic data and the presentation of the results. The stages of the design and implementation of a GIS project are discussed. The application areas and the specifics of the GIS projects for them are also referred **PREREQUISITES:** Mathematics, Databases, Algorithms synthesis and analyses.

TEACHING METHODS: Lectures using video-presentation with beamer, laboratory works for development, experiments, analyses and discussion on given examples and problems.

METHOD OF ASSESSMENT: Exam during the exam session with duration two academic hours, students give written answers to questions, problems or tasks (80%), laboratory works (20%).

INSTRUCTION LANGUAGE: English

BIBLIOGRAPHY: Clarke K., Getting Started with Geographic Information Systems, Prentice Hall, 2010; Jensen J., R. Jensen, Introductory Geographic Information Systems, Prentice Hall, 2012; Longley P., M. Goodchild, D. Maguire, D. Rhind, Geographic Information Systems and Science, Wiley, 2010; Kennedy M., M. Goodchild, J. Dangermond, Introducing Geographic Information Systems with ArcGIS: A Workbook Approach to Learning GIS, Wiley, 2013; Harder C., T. Ormsby, T. Balstrom, Understanding GIS: An ArcGIS Project Workbook, Esri Press, 2013; Kang-tsung Chang, Introduction to Geographic Information Systems with Data Set CD-ROM, McGraw-Hill, 2013; Bolstad P., GIS Fundamentals: A First Text on Geographic Information Systems, Eider Press, 2012; Heywood I., S. Cornelius, S. Carver, An Introduction to Geographical Information Systems, Prentice Hall, 2012; Law M., Getting to Know ArcGIS for Desktop, Esri Press, 2013; Gorr W., K. Kurland, GIS Tutorial 1: Basic Workbook, Esri Press, 2013; Allen D., GIS Tutorial 2: Spatial Analysis Workbook, Esri Press, 2013; Allen D., J. Coffey, GIS Tutorial 3: Advanced Workbook, Esri Press, 2010; Rubalcava R., ArcGIS Web Development, Manning Publications, 2014; Pimpler E., Building Web and Mobile ArcGIS Server Applications with JavaScript, Packt Publishing, 2014; Zandbergen P., Python Scripting for ArcGIS, Esri Press, 2014; Amirian P., Beginning ArcGIS for Desktop Development using .NET, Wrox, 2013.

DESCRIPTION OF THE COURSE

Name of the course: Networks Communications and Wireless Technologies	Code: MCSCe11.2	Semester: II
Type of teaching: Lectures and laboratory work	Lessons per week: L – 2 hours; LW – 1 hours	Number of credits: 4

LECTURERS:

Associate Prof., PhD Georgi Naydenov
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Associate Prof., PhD Petko Stoyanov
(FCSC)
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Technical University of Sofia

COURSE STATUS IN THE CURRICULUM: Optional course for the students of specialty “Computer and Software Engineering” in the master programme of the Faculty of Computer Systems and Control.

AIMS AND OBJECTIVES OF THE COURSE:

The aim of the course is to acquaint students with the basic principles, standards and tendencies of development in the field of networks communications and wireless technologies. This will help them in future to professionally solve system tasks in the area of telecommunications.

DESCRIPTION OF THE COURSE:

The aim of the course is to present the theoretical bases and contemporary achievements in the field of networks communications and wireless technologies. The lectures begin with introduction to the physical bases and principles of mobile communications. Basic methods of organization of data exchange and media access control are presented. The teaching material is illustrated by practical solutions of wireless communication systems: radio, satellite and cellular. Teaching course continues with standards and tendencies for development of Integrated Service Digital Networks (ISDN). Typical hardware and specialized algorithms are also studied. Basic attention is paid to the architecture and principles of functioning of Asynchronous Transfer Mode (ATM). Principles of routing and control of data flow in TCP/IP – computer networks are presented in detail.

PREREQUISITES: Basic knowledge in Computer Networks and Industrial Computer Networks.

TEACHING METHODS: Lectures with slides, multimedia projector and additional text materials; laboratory work based on instructions with a tutorial for every laboratory theme.

METHOD OF ASSESSMENT: Final mark is based on a written examination during the exam session with duration two academic hours in the end of the second semester.

INSTRUCTION LANGUAGE: English.

BIBLIOGRAPHY:

- Comer Douglas, Computer Networks and Internets, Amazon, January, 2014;
- Comer Douglas, Internetworking with TCP/IP, Vol.1, 6th Edition, Amazon, May, 2013;
- Larry Peterson, Bruce Davie, Computer Networks, 5th Edition, Amazon, March 2011