# MAJOR FIELD OF STUDY “INFORMATION SYSTEMS AND TECHNOLOGIES”, MASTER OF SCIENCE, PERIOD OF STUDY 1 YEAR

## QUALIFICATION CHARACTERISTICS
OF MAJOR FIELD OF STUDY "INFORMATION SYSTEMS AND TECHNOLOGIES"
FOR EDUCATIONAL-QUALIFICATION DEGREE "MASTER"
WITH PROFESSIONAL QUALIFICATION "MASTER OF INFORMATION SYSTEMS AND TECHNOLOGIES", PERIOD OF STUDY 1 YEAR

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

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

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

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

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

**Practices and internships**

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

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

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

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

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

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

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

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

- 13306005 Head of Information Services
- 13306006 Manager, Computer Services
- 13306008 Head, Information and Communication Technologies
- 25116001 Systems analyst, information technology
- 25116002 Business Analyst, Information Technology
- 25145005 Head of a team of programmers
- 25146004 Database Management Systems Programmeганни
- 25216001 Analyst, databases
- 25216002 Database Administrator
- 25216003 Expert, database system software
- 25216004 Designer, databases
- 25216005 Programmer, databases
- 13306010 Manager, Software Applications
- 13306011 Manager, Software Development
- 21666003 Expert, prepress
- 21663006 Web designer
- 25116004 Designer, information systems
- 25116005 Business consultant, information technology
- 25196006 Analyst, Computer Quality Assurance
- 25196003 Information technology specialist, coordinator
- 25196004 Information technology planning specialist
- 25196005 Software testing specialist
- 25196007 Specialist training, software applications
- 25296001 Expert, security of information and communication technologies
- 25296002 Expert, information assurance
- 25296005 Data Security Consultant
- 3306012 Manager, Data Processing
- 13306014 Manager, Internet Supplies
- 24227065 Information Security Officer
- 24346001 Account Manager: Sales (Information and Communication Technologies)
- 25226003 Administrator, Information Systems
- 25126001 Expert, design and programming
- 25126002 Designer, software
- 25126004 Developer, software
- 25125006 Head of IT projects
- 25136002 Programmer, websites
- 25136004 Designer, web sites
- 25136005 Consultant, Internet programming

- 25136006 Developer, Internet Applications
- 25136007 Developer, PC games
- 25146001 Programmer, software applications
- 25143002 Specialist, application programming
- 25146003 Programmer, Business Management Systems
- 25296006 Specialist, data processing
- 25296007 Specialist, computer crimes
- 25296008 Data security specialist
- 35143001 Admin, Website
- 35143003 Webmaster
- 35143005 Website Management Consultant
- 35143006 Coordinator, website management, as well as in all spheres of public and economic life, where specialists in the field of informatics and information systems and technologies are needed.

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

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

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

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

**CURRICULUM**

FIELD OF STUDY: INFORMATION SYSTEMS AND TECHNOLOGIES,
PERIOD OF STUDY: 1 YEAR (2 SEMESTERS)

| First semester | ECTS | Second semester | ECTS |
|---|---|---|---|
| **Compulsory Courses** | | **Compulsory Courses** | |
| Data mining | **6.0** | Business Process Management Systems | **6.0** |
| Component-Oriented Software Engineering | **6.0** | Application software for automatic translation | **4.5** |
| Semantic Web | **6.0** | Optional 3 (Group II) | **4.5** |
| Optional 1 (Group I) | **6.0** | Written State Exam or Graduate Thesis Defense | **15.0** |
| Optional 2 (Group I) | **6.0** | | |
| **TOTAL:** | **30** | **TOTAL:** | **30** |
| **Optional Courses (Group I)** (Choose two disciplines) | | **Optional Courses (Group II)** (Choose one discipline) | |
| JSP and Java servlet programming (Web programming) | | Training at IT Company (Institution) | |
| Stochastic simulation | | Natural language processing systems | |
| Applied Statistics | | Information systems in bioinformatics | |
| Cloud technologies | | Information Systems with Client-Server Architecture | |
| Applications of databases in bioinformatics | | | |
| Theory, Algorithms and Technologies for Speech Recognition | | | |

**Language of Instruction: English.**

## DECRIPTION OF THE COURSES

### Data Mining

**Semester:** 1 semester

**Course Type**: lectures and lab exercises

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

**ECTS credits**: 6.0 credits

**Department:** Informatics

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

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

**Course Description**:

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

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

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

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

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

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

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

**References:**

1. Berkhin P, Survey of Clustering Data Mining Techniques.

2. Jiawei Han and Micheline Kamber,Data Mining: Concepts and Techniques, Second Edition, 2006.

3. Jiawei Han, Jian Pei and Micheline Kamber, Data Mining: Concepts and Techniques, Third Edition, 2012.

4. Daniel T. Larose , Discovering knowledge in data. An Introduction to Data Mining, John Wiley & Sons, Inc., Hoboken, New Jersey, 2005.

5. Murthy S., Automatic Construction of Decision Trees from Data: A Multi-Disciplinary Survey. Journal of Data Mining and Knowledge Discovery, vol. 2, num. 4, 1998.

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

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

## Component-Oriented Software Engineering

**Semester:** 1 semester

**Course Type**: lectures and lab exercises

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

**ECTS credits**: 6.0 credits

**Department:** Informatics

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

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

**Course Description:** The basic principles for creating and using components in the development of software solutions are presented in the course. The topics to be discussed are as follows: programming fundamentals. Understanding the component library; introduction to component creation2. Introduction to component creation; object-oriented programming for component writers; creating properties; creating events; creating methods; using graphics in components; handling messages; making components available at design time; modifying an existing component; creating

a graphic component; customizing a grid; making a control data aware; making a dialog box a component; extending the IDE;

**Course Objectives:**

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

After completion of the course students should be able to:

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

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

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

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

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

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

**References:**


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


**Abbreviation:**

FS: Fall Semester

# Semantic Web

**Semester:** I semester

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

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

**ECTS credits:** 6 credits

**Department:** Informatics

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

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

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

**Course Objectives**

The student should obtain knowledge of:

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

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

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

**Assessment:**

- Project- 50%
- Final Test- 50%

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

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

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

**References:**


1. Semantic Web: Extending the World Wide Web to make internet data machine-readable to offer significant advantages such as reasoning over data and operating with heterogeneous data sources. (2022). One Billion Knowledgeable.
2. Hendler, J., Gandon, F., Allemang, D. (2020). Semantic Web for the Working Ontologist: Effective Modeling for Linked Data, RDFS, and OWL. United Kingdom: Association for Computing Machinery and Morgan & Claypool Publishers.
3. DeWeese, K. P., Segal, D. (2022). Libraries and the Semantic Web. Switzerland: Springer International Publishing.
4. Hogan, A. (2020). The Web of Data. Germany: Springer International Publishing.
5. Kornai, A. (2020). Semantics. Switzerland: Springer.


## JSP and Java servlet programming (Web programming)

**Semester:** 1 semester

**Course Type**: lectures and exercises

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

**ECTS credits:** 6

**Department:** Informatics

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

**Course Status:** Optional course

**Course Description:**

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

• Socket programming - development of Java applications that communicate over the Internet / Intranet via TCP / IP protocols, such as Chat client / servers, Web servers, Mail client / servers, etc.

• Java applets - development of small Java applications that can be embedded in Web pages and run from the client's Web browser.

• Web applications - development of Web applications with Servlets and Java Server Pages (JSP) technologies, creation and deployment of Web applications according to Sun standards for J2EE, work with Tomcat server.

In order to understand the material, it is necessary for students to have basic knowledge of Internet organization, programming, Java and HTML. Due to its large volume, the topic will be divided into several modules.

Objectives: The course aims to provide new knowledge related to web programming.

The main task is for the student to acquire knowledge of web programming.

**References:**

1. Светлин Наков, Борис Червенков, Интернет програмиране с Java, http://www.nakov.com

2. The Java EE 5 Tutorial - http://java.sun.com/javaee/5/docs/tutorial/doc/JavaEETutorial.pdf

3. Java API документация - http://java.sun.com/javase/6/docs/api/

4. Eclipse - www.eclipse.org

5. Apache Tomcat - http://tomcat.apache.org/

6. Step-by-step tutorial: http://www.java-tips.org/java-tutorials/tutorials/introduction-to-java-servlet.

## Stochastic simulation

**Semester:** I semester

**Course Type**: lectures and exercises

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

**ECTS credits**: 6

**Department:** Informatics

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

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

**Course Description:**

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

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

**Assessment:** course project and exam

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

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

**References:**

*1) Основна*

1. Калинов К.,Статистически методи в поведенческите и социалните науки, НБУ, 2016
2. Johnson, Richard A.; Wichern, Dean W. (2007). Applied Multivariate Statistical Analysis (Sixth ed.). Prentice Hall. ISBN 0-13-187715-1, ISBN 978-0-13-187715-3.
3. Richard G. Bereton, Data analysis for the laboratory and Chemical Plant, University of Bristol, UK, 2009
4. The Statistics Homepage - http://www.statsoft.com/textbook/stathome.html ©1984-2018
5. COMPUTATIONAL CHEMISTRY, A Practical Guide for Applying Techniques to Real-World Problems David C. Young, 2001, Copyright by John Wiley & Sons, Inc.
6. Wolfgang Karl Härdle, Léopold Simar, Applied Multivariate Statistical Analysis, Springer, 2019.

*2) Допълнителна*

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

**Abbreviation:**

**FS**: Fall Semester

## Applied Statistics

**Semester:** I semester

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

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

**Credits Numbers**: 6 credits

**Department:** Informatics

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

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

**Course description:**

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

**Objectives:**

The students should obtain knowledge of:

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

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

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

**Assessment and Evaluation**

Project- 70%

Final Test- 30%

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

**Registration for the Course:** required

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

## Cloud technologies

**Semester:** 1 semester

**Type of Course:** lectures and exercises

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

**Credits Number:** 6 credits

**Department:** Informatics

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

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

**Course description:** The course is introduction in main aspects of knowledge bases and application.

**Objectives:**

The student should obtain knowledge of:

- Cloud computing.
- Application of knowledge bases.

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

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

**Assessment and Evaluation**

Project- 50%

Final exam- 50%

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

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

**References:**


1. Blain Barton – "Microsoft Public Cloud Services: Setting up Your Business in the Cloud", Microsoft Press, 2015.
2. . Thomas Erl, Ricardo Puttini, Zaigham Mahmood – "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall, Upper Saddle River, NJ, Fourth Printing, 2014.
3. Michael J. Kavis – "Architecturing the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", Wiley, 2014.
4. Michał Tomasz Jakóbczyk- "Practical Oracle Cloud Infrastructure" ,Oracle, 2020
5. Стоян Велев, Христо Добчев. SAP Labs Bulgaria 2013


## Applications of databases in bioinformatics

**Semester:** I semester

**Course Type**: lectures and exercises

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

**ECTS credits**: 6

**Department:** Informatics

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

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

**Course Description:**

The main types of biological data bases and bioinformatics tools will be presented in the course. Various highly effective data sources in bioinformatics will be explained in detail. Examples will

illustrate the application databases in different areas of bioinformatics. The course will use modern software tools for working with biological databases.

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

**Assessment:** current control and exam

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

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

**References:**


*1) Basic*

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

*2) Additional*

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


Abbreviation:

**FS**: Fall Semester

**SS**: Spring Semester

## Theory, Algorithms and Technologies for Speech Recognition

**Semester:** 1st semester

**Course Type**: lectures and lab exercises

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

**ECTS credits**: 6.0 credits

**Department:** Informatics

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

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

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

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

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

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

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

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

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

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

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

**References:**


1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, Spoken Language processing – A Guide to Theory, Algorithm, and System Development, Prentice Hall PTR, 2001
2. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon (2001) Spoken Language processing – A Guide to Theory, Algorithm, and System Development, Prentice Hall PTR
3. Stephen E. Leinson (2005) Mathematical Models for Speech Technology, John Wiley & Sons
4. Wu Chou, Bing Hwang Juang (2003) Pattern Recognition in Speech and Language Processing, CRC Press
5. Joseph Keshet, Samy Bengio (2009) Automatic Speech and Speaker Recognition – Large Margin and Kernel Method, John Wiley & Sons
6. Lawrence Rabiner, Ronald Schafer (2010) Theory and Application of Digital Speech Processing, Prentice Hall

7. Daniel Jarefsky, James Martin (2008) Speech and Language Processing (2nd Edition), Prentice Hall
8. Dong Yu, Li Deng (2014) Automatic Speech Recognition: A Deep Learning Approach, Springer
9. James R. Lewis (2011) Practical Speech User Interface Design, CRC Press
10. Homayoon Beigi (2011) Fundamentals of Speaker Recognition, Springer
11. Willi-Hans Steeb (2005) Mathematical Tools in Signal Processing with C++ and Java Simulations, University of Johannesburg, South Africa
12. K. R. Rao, D. N. Kim, J. J. Hwang (2010) Fast Fourier Transform: Algorithms and Apllications, Springer
13. Р. Кралева (2019) Разпознаване на реч: Корпус от говорима детска реч на български език, ISBN: 978-954-00-0199-9, УП „Неофит Рилски“, Благоевград.
14. Data Exchange System, http://childes.psy.cmu.edu/
15. Praat: doing phonetics by computer, http://www.fon.hum.uva.nl/praat/
16. WaveSurfer, http://www.speech.kth.se/wavesurfer/
17. The International Phonetic Association, http://www.langsci.ucl.ac.uk/ipa/index.html

## Business Process Management Systems

**Semester**: 2 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

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

**Course Status**: Compulsory Course in the Information Systems and Technologies MSc Curriculum

**Course Description:**

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

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

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

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

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

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

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

**References:**

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

2. Marlon Dumas, Marcello La Rosa, Jan Mendling, Hajo A. Reijers, Fundamentals of Business Process Management, Springer-Verlag Berlin Heidelberg 2013.

3. Business Process Management For Dummies®, 4th IBM Limited Edition, John Wiley & Sons, Inc, 2017.

4. http://fbm.uni-ruse.bg/d/bsa/bsa-L1.pdf.

5. http://tuj.asenevtsi.com/BIS09/BIS30.htm , Христо Тужаров , Бизнес процеси

6. http://www.uni-svishtov.bg/dialog/2013/INI/05-statia-2013.pdf - Кремена Маринова

7. http://www.antipodes.bg/bg/cubes/what_is_bpm/ - , BPM

## Application software for automatic translation

**Semester:** 2 semester

**Course Type:** lectures and lab exercises

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

**ECTS credits**: 4.5 credits

**Department:** Informatics

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

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

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

Objectives: The course aims to provide students with basic theoretical knowledge of the basic components that make up such software and practical skills for applying modern tools for computer-assisted translation (Computer Assisted Translation Tools (CAT) Tools). The possibilities for creating and working with terminological dictionaries and databases of multilingual translation memories (TM) are considered. The training is focused on mastering the specialized translation software SDL Trados Studio, which is an indispensable assistant to the modern translator, and in addition its use is mandatory for all translations for the needs of the European Union bodies.

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

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

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

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

**References:**

1. Fuzzy sets and fuzzy logic: theory and applications. Prentice Hall, 1995. ISBN 978013101 1717.

2. Hans—Jilrgen Zimmermann. Fuzzy set theory—and its applications. 4th. Kluwer, 2001. ISBN 9780792374350.

3. Fundamentalsof fuzzy sets. T. 7. Springer, 2000. ISBN 9780792377320.

4. Beynon—Davies, Paul (2003). Database Systems (3rd ed.). Palgrave Macmillan. ISBN 978—1403916013
5. Kockaert, Hendrik; Steurs, Frieda (2015). Handbook of Terminology. 1. Amsterdam: John ‘|
6. Benjamins Publishing Company. p. 225
7. DePaIma, Donald A. (July 2005). "SDL-TRADOS: Language Service Provider Reaction to ‘ SDlz's‘Purchase of TRADOS"
8. Ullman, Jeffrey; Widom, Jennifer (1997). A First Course in Database Systems. Prentice—Hall. ISBN 0138613370

## Training at IT Company (Institution)

**Semester:** II semester

**Course Type:** seminars and lab exercises

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

**ECTS Credits:** 4,5 credits

**Department:** Informatics

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

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

**Course description:**

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

**Objectives:**

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

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

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

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

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

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

## Natural language processing systems

**Semester:** II semester

**Course Type:** lectures and lab exercises

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

**ECTS credits:** 4,5 credits

**Department:** Informatics

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

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

**Course Description:** Natural Language Processing, usually shortened as NLP, is a subfield of artificial intelligence that deals with the interaction between computers and humans using the natural language. NLP systems capture meaning from an input of words (sentences, paragraphs, pages, etc.) in the form of a structured output

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

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

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

**Assessment:**

- Project- 50%
- Final Test- 50%

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

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

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

**References:**


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


## Information systems in bioinformatics

**Semester:** II semester

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

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

**Credits Number:** 4.5 credits

**Department:** Informatics

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

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

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

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

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

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

**Assessment:** written final exam

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

**References**


1. Увод в BioJava. http://biojava.org/wiki/Main_Page
2. Прееслав Наков. Въведение в програмирането с Java. 2012, http://www.introprogramming.info /intro-java-book/read-online/
3. Talarida J. Jacobs. Jacobs L. The dose –response relationship in pharmacology. Springer – Verlag. New York 1979
4. Jose Maria Lagaron, Antimicrobial Polymers, 0470598220, Publisher : Wiley, 2013
5. Approved drug products with therapeutic equivalence evaluations, u.s. department of health and human services, 2013
6. Knuth D.E. Postscript about NP-hard Problems, SIGACT News, 1974.
7. Reingold E.M., Neivergelt J., Deo N. Combinatorial algorithms (Theory and Practice), 1980.


## Information Systems with Client-Server Architecture

**Semester: 2** semester

**Course Type**: lectures and lab exercises

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

**ECTS credits**: 4.5 credits

**Department:** Informatics

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

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

**Course Description:**

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

**Course Objectives:**

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

After completion of the course students should be able to:

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

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

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

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

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

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

**References:**


1. Embarcadero Technologies. Developing Database Applications: Embarcadero Technologies. Retrieved from Embarcadero Technologies Web Site. 2021.
2. Marco Cantu. Mastering Delphi 7. Publisher Sybex. 2003.
3. Marco Cantu. Delphi 2010 Handbook: A Guide to the New Features of Delphi 2010. 2010.
4. Mario Szpuszta, Ingo Rammer. Advanced .NET Remoting. Publisher: Apress; 2nd ed. 2005.

5. Bob Swart. Delphi XE DataSnap Development Essentials. Bob Swart Training & Consultancy. 2011.
6. Cary Jensen Ph,D. Delphi in Depth: ClientDataSets, Publisher CreateSpace Independent Publishing Platform. 2011.
7. Andrew Troelsen. Pro C# 5.0 and the .Net 4.5 Framework, Apress. 2012.
8. Tim Patrick. Microsoft ADO.NET 4 Step by Step. Publisher: Microsoft Press. 2010.
9. Xavier Pacheco. Delphi for .NET Developer's Guide. Publisher: Sams Publishing. 2004.

**Abbreviation:**
SS: Spring Semester