UNIVERSITETI I EVROPËS JUGLINDORE

УНИВЕРЗИТЕТ НА ЈУГОИСТОЧНА ЕВРОПА

SOUTH EAST EUROPEAN UNIVERSITY

Study program	**E-Technologies (2012/2013)**
Faculty	Contemporary Sciences and Technologies
Study Cycle	Third Cycle (PhD)
ECTS	180
Title	Doctor of Sciences in E-Technologies
Accreditation archive number [180]	03-874/12
Accreditation archive number []	03-203/2 (26.03.2013)
Decision for starting of the program	03-203/2 (26.03.2013)
Accreditation date	21.12.2012

Description of the program

The third cycle of doctoral studies in E-technology at the Faculty of Contemporary Sciences and Technologies support traditional IT technologies with an emphasis on business orientation towardsindustry. This expertise is unique and is of great importance for the labor market and customers who want to integrate their systems in traditional IT infrastructures. The program is a continuation of education of personnel who have completed undergraduate and postgraduate studies. The program will

allow for a higher degree of specialization in scientific research and professional fields and in their own independent research activities, as well as in academic and professional career. In this process of study students will acquire the academic, intellectual and technical competencies and communication skills through various forms of preparing for research. Rapid changes in society impose and require a new approach to preparing new generations with scientific titles for the needs of society, based on knowledge, and intended for the global labor market in the area of technology.

Career

The program provides continuing education of personnel, who have completed undergraduate andpostgraduate studies. The program will enable the highest level of scientific-research preparation in the professional field and own research activities, as well as in professional and academic career. In this process of study, students will be equipped with competencies and academic, intellectual and technical communications skills through various forms and will be prepared for scientific research work. Rapid changes in society impose and require new approaches for preparing new generations of scientific knowledge to the needs of the knowledge based society and are dedicated to the global labor market in the field of e-Technology.

Learning outcomes

Knowledge and understanding

- Possession of knowledge and understanding of e-technology areas and information architectures, network societies

and internet cultures, Internet and web technologies proportionally expanded in comparison with second cycle studies.

- Ability to develop and implement original and creative ideas in environments where overlapping or interconnected areas of e-technologies.
- Ability to apply interdisciplinary knowledge and demonstration of specialist competencies in e-technologies.

Applying knowledge and understanding

- Ability to critically, independently and creatively solve problems in new, previously not encountered or environments for which has no prior experience in a multidisciplinary context of real organizational environment.
- Planning, managing and evaluation of independent research in the field of e-technologies implementing appropriate Calculator tools, environments and technologies.
- Creativity and originality in the interpretation of the knowledge of e-technological processeses and appropriate use of computer-based tools and environments based on defined techniques for research and investigation.

Making judgement

- Ability for creative integration and synthesis of knowledge from many areas related to media processeses and use of computer tools and techniques.
- Ability to deal with complex situations related to process-specific technologies, the identification of appropriate specialized domain instances in the internet and informatics and making sound judgments in situations lacking complete information or data based on personal, social and ethical principles and responsibilities related to the application of knowledge and understanding.

Communication skills

- Ability to clearly and unambiguously communicate conclusions, results, studies and knowledge of e-technologies and informatics specialists' areas with the ability to adapt to the style and form of expression for non specialists.
- Competence for critical, independent and creative argumentative research, evaluation methodologies and proposing and defending new hypotheses.
- Ability to initiate, conduct, and taking responsibility for individuals and groups in cases where communication, organizational and informatics competencies are of essential importance.

Learning skills

- Ability to identify personal needs and directions for individual and autonomous additional education and its performance independently and autonomously in normal business and IT areas.
- Ability to assume responsibility for continuous individual learning in specialized and new e- technologies.

List of courses

Semester 1

- [10.0 ECTS] **Research Methodology**
- [10.0 ECTS] **Advanced topics in the field of cloud processing and Grid**
- [10.0 ECTS] **Advanced concepts in Information Systems**

Semester 2

- [10.0 ECTS] **Advanced topics in the field of Information and Communication Technologies**
- [10.0 ECTS] **Elective course 1**
- [10.0 ECTS] **Free elective course 1**

Semester 3

- [20.0 ECTS] **Preparation and submission of the application for the topic of doctoral dissertation -research**
- [10.0 ECTS] **Doctoral seminar with a presentation of the report I**

Semester 4

- [10.0 ECTS] **Researching and organizing a workshop for research practice**
- [20.0 ECTS] **Publications**

Semester 5

- [20.0 ECTS] **Presentation of Research Results**
- [10.0 ECTS] **Doctoral seminar with a presentation of the report II**

Semester 6

- [30.0 ECTS] **Doctoral Thesis**

Description of courses

Core courses

- **Research Methodology**
  The program goals: - To understand the advanced scientific research debates dedicated to the subject in the chosen field, especially the development of key concepts, epistemological aspects of their research. - To collect relevant research material that will utilize their scientific activities and publicity. - To understand the magnitude of the research process and access to the various methods of scientific research and the same with advanced techniques, to be able to use in scientific and professional activity. - With advanced approach to study the relationship between theory and research practice. - To apply the skills and knowledge they have acquired in their doctoral theses, projects.

- **Advanced topics in the field of cloud processing and Grid**
  The goals of the course are to enable a detailed notice of cloud structures (in the cloud) and GRID processing which are the technological bases for any of E-solutions. Various components of these systems will be presented as well as how these components fit together. The purpose of the course is to provide a current review for cloud (cloud concept) and GRID processing, give a report on the real experiences and explain the available technologies as those actuals as well as those announced by companies and laboratories for standardization bodies. Cloud processing (cloud) is a processing paradigm and "distributed" of big dimensions driven by the dimensioned economy, in which there is a choice of power, storage, and abstract service platforms, virtual dynamically skalabile, and managed sent requests to external users-customers via the internet. Cloud processing (cloud) is becoming the main driving power of information technologies in recent years, and guides us that in the future those will not process in local machine but will use centralized device which is operated by the third party. Governments, research institutions and industrial leaders are in development and hary to adopt cloud processing (cloud concept) in order to address the constant demands for increasing processing power and memory increase consumption in the Internet era.

- **Advanced concepts in Information Systems**
  The study program goals: Study of advanced concepts from the field and terminology of information systems. - Information systems and advanced concepts: hardware, software, networks - E-world: advanced choice for e-business and e-commerce - Evolutionary Processes To learn more about information systems and advanced technologies that improve business values and different business processes across the organization. To apply concepts with different management disciplines, during the process of analysis, interpretation, evaluation and decision making. Understand the redesign process of organizations using information systems. To describe the role of infromacionit systems in decision making. To consider information security as well as ethical and social questions. Become familiar with the Internet, electronic commerce (e-commerce) and electronic business (e-business). Students will be enabled to work on projects, individually or in groups, who by nature can be: case studies, scientific-research projects, development projects or pratical work.

- **Advanced topics in the field of Information and Communication Technologies**
  The purpose of this course is to offer students knowledge and deep understanding of advanced methods and approaches needed to support and enhance the accessibility of Information and Communication Technologies, alleviating the challenges faced across areas such as business intelligence, effective computing, opinion mining, text understanding, human-computer communication, human-human interaction etc. Most of these techniques are based on machine learning algorithms, which assist in drawing conclusions within unstructured data that allow patterns to be detected, providing an overview of the main problems that researchers are facing nowadays in this field, with a set of selected publications in the area.

- **Preparation and submission of the application for the topic of doctoral dissertation -research**
  After the second semester, students begin their activities for the development of the plan on his/her doctoral dissertation. Activities include the definition of literature, defining hypothetical framework, the definition of the work methodology and determination of the individual plan as well as the first public presentation. If necessary, can be held elective courses for this purpose.

- **Doctoral seminar with a presentation of the report I**
  Candidates will submit a list of all seminars attended, which are relevant to their field and/or their research interest at any where in the world, on the attached prescribed form to their supervisors for acknowledgement. These seminars should be research in nature. A report should be written by the students in his/her own words for each seminar attended. The report summarizes key points and provides student's critical assessment. The student is typically required to initiate a discussion with fellow researchers on the topic to help him/her write the report.

- **Researching and organizing a workshop for research practice**
  Researching and organizing a workshop for research is an integral part of the the study program. Candidates will enhance their knowledge, broaden research outlook, and improve thinking and communication skills. Attendance and participation in workshop, together with the related discussions with fellow researchers on topics addressed in the workshop, will aid in the candidate skills of conducting the dissertation.

- **Publications**
  Publication of research activities under the table relevant to the media for publication. Publication activities and successes of the candidate checked before scientific audience by area and the relevance of the research.

- **Presentation of Research Results**
  At the end of the 5th semester, after the research activities under the individual plan, overall results of this phase of the paper and the research will be presented publicly by the candidate.

- **Doctoral seminar with a presentation of the report II**
  Candidates will submit a list of all seminars attended, which are relevant to their field and/or their research interest at any where in the world, on the attached prescribed form to their supervisors for acknowledgement. These seminars should be research in nature. A report should be written by the students in his/her own words for each seminar attended. The report summarizes key points and provides student's critical assessment. The student is typically required to initiate a discussion with fellow researchers on the topic to help him/her write the report.

- **Doctoral Thesis**
  Continuing the work of doctoral dissertation. Submitted thesis (dissertation), accepted by the Scientific-Teaching Council of the Faculty and submitted to committee members and begins the procedure of public defence.

Elective courses

- **Advanced topics in software engineering**
  The purpose of the course is to provide students an opportunity to learn advanced concepts and achieve deep understanding, critical and systematic knowledge of the principles and techniques for software specification, analysis and design, programming, testing and evaluation, maintenance and management of software applications effective projection. Results of the course are that students will be provided a clear understanding of the tools and methodologies for development of software solutions. After following the course the students should be able to: - Analyze the process of developing software solutions and precisely and concisely express the essence; - Design the module structure for the solution of the problem and evaluation of alternatives; - Programming and implementation of software module so would execute in the right and efficient manner; -Work in small teams, cooperate in various aspects of software development, and in the exchange of ideas and managing projects in an organized manner; Assess the skills necessary for development and methodological questions for software development, such as the importance of thought the user as feedback, work with limited resources, maintenance, testing, and managing software development team.

- **Advanced topics in applied statistics**
  The purpose of this course is to enable students to acquire the advanced knowledge of statistics that have direct application in the field of computer science and technology. The goal is to learn how to do the processing of advanced statistics, their laws, their representation legalities of adopting appropriate conclusions based on data processed etc. Also the aim is to learn advanced principles of probability and how these principles can be applied in various areas of everyday life, especially in the area computer sciences.

- **Advanced topics in XML and semantic web**
  The purpose of this course is to offer students knowledge and deep understanding of advanced methods and approaches related to the use of modern techniques for information search and adaptive mechanisms for Web-based content, and semantic web technologies. Upon completion of this module the student should have a good understanding of the various methods of information search and data mining on the Internet; good understanding of the different approaches to the collection, exploitation and application of intelligent mechanisms for web-based data and content; understand principles semantic modeling of information and how that can be used for automation, integration and reuse in web applications; understand different development frameworks for implementing adaptable web applications and services as well as be able to implement a prototype web application that uses the adaptive and semantic mechanisms to provide a rich user experience.

- **Advanced topics from web architectures**
  The purpose of this course is to provide students with a deeper understanding and competencies of advanced concepts and ideas that emphasize the architectural models of web-enabled and mobile internet. Upon completion, students should: have a deep understanding of the concepts, principles, methods and techniques required for the design, analysis and maintenance of large and scale able web and mobile applications and services; understand and be able to make appropriate design decisions related to the persistence, flexibility, scale ability and maintainability of the various software architectures used in web and mobile applications; have a deep understanding of concept regarding the complex web infrastructures and protocols that are required for the establishment of social media applications and mobile services; to have a good understanding of different architectural patterns for deploying large-scale web and mobile applications as well as to understand and use different integration approaches for expansion of existing web applications in order to meet the requirements of on-line communities.

- **Advanced topics from computer architectures**
  The course will discuss a series of advanced topics related to the architecture, programming model, compilation, of computer architectures. The goal is to identify key research issues and, through the projects, evaluate the potential of promising techniques. The goal is to provide performance and power efficiency similar to application-specific designs while maintaining the programme ability and flexibility of general-purpose processors.

- **Advanced topics in the analysis and design of algorithms**
  The course focuses on advanced principles for the design of algorithms and realizes an overview of existing algorithms. The focus is placed on the process of designing algorithms, including problems, specifications, algorithms; efficiency: temporal and spatial complexity; big O notation; fundamental design strategies: greedy algorithms, divide and conquer, dynamic programming. The course will focus on the most important existing algorithms in bioinformatics, including algorithms for exact match strings, suffix trees, aligning pairs of dynamic programming algorithms; heuristical algorithms: Blast and FastA; statistical alignment algorithms: Hidden Markov models; alignment of multiple sequences: algorithms and heuristics; algorithms related to the molecular structure: determination and prediction of the structure. Special emphasis will be given to the complexity and usability of the algorithms.

- **Advanced topics of security in E-Technologies**
  The purpose of this course is to provide students with an understanding of data security in computer science. Students will read research papers, initiate group discussion regarding scientific papers, perform projects present their own research projects in written and oral format. The course also aims to expose students to cutting-edge research topics in the relevant areas of information security. The course will include theoretical and applied issues in the field of information security.

- **Advanced topics from biomedical data mining**
  The purpose of this course is to enable students to acquire advanced knowledge in the field of data mining engineering and its application in the field of bioinformatics. The course will consist of a variety of topics that treat the use of data collection techniques for data mining for collecting and organization of data in the field bioinformatics, and discovering new models and knowledge from these data. Techniques and the knowledge in the field of data mining that will be learned in this course, students will be able to use not only in the field of bioinformatics, but also in other

areas in which they will work during their studies and in their further research.

- **Advanced topics in applied information processing and communications**
  The course covers the analysis of large diapason of information processing by using a variety of applications and case studies. The course covers various components and their functions, and their communications with each other as one information system.

- **Advanced topics in the field of information and communication technologies in energy**
  The purpose of this course is to provide familiarity with the new trends in the world development of energy (generation, transmission and distribution). Special focus on technologies and concepts that are in tune with the policy of the European Union for energy systems. Power systems with greater efficiency, reduced impact on climate change, the use of alternative energy sources and the involvement of consumers in managing. Power Quality (Power Quality-PQ). Sustainable development of energy systems. Emphasis towards smart metering and new opportunities for measuring physical magnitudes. Virtual instrumentation and new measurement methodologies. New communication opportunities in the energy sector. Using advanced IC technology management (monitoring & control) of modern energy resources. Concepts, criteria and risk management of energy systems through ICT. International standards for power systems and communication networks. With the completion of this course students will be introduced and trained on: - World trends in the development of energy systems and networks, - European Union policy for ICT in energy systems, - Virtual instrumentation and new methodologies for measuring, - Advanced management ICT energy resources - International standards for power systems and communication networks.

- **Computer Crime**
  The objectives of the course program consist in the fact that students will: - Have a basic understanding of computer crime as a more contemporary form of execution of criminal acts, the legal framework, enforcement and sanctions for offenses related to computer crime as well as the forms and ways to combat this type of crime; - Have a detailed knowledge of computer crime in the Republic of Macedonia as well as in countries in the region and in the international arena; - Have their own critical thinking; - Be able to perform analysis and research on cyber crime; - Have the ability to present results of research, team work and debate; - Be able to apply the theory on real life practical cases.

- **Professional Communication**
  The course is focused on the development of those communication skills that are essential for effective functioning in the professional world. Students will study the process for analysis of different communication situations, and will accordingly comprehend them. Among the themes that will be covered are communication in organization, interpersonal and group communication, oral presentations, interviews for employment, professional business letters and interpersonal skills including group dynamics and teamwork.

- **Game Theory**
  This course aims to improve the student strategic decision-making ability in competitive situations in which the student evaluation of the outcome of an action depends not only on the choices made by the student, but also on the choices made by others. The course concentrates on an analytic method derived from game theory, which provides a rigorous analytic framework for structuring competitive situations, identifying the alternatives, and choosing among them. The basic approach will be to break the complexity down into pieces, use game theory tools to analyze the pieces, and then reassemble the pieces into a logically coherent understanding. The goal is to become better strategic decision makers when faced with competitive challenges. The main objectives will be to use game theory concepts and tools to identify, diagnose and analyze competitive challenges facing firms in dynamic industries and apply game theory concepts and tools to develop strategies for competitive advantage. All of this will be done by analyzing different games.

- **Public Institutions and Management**
  Objectives of the course program are: - A deep understanding of the complexities of public policy and the administrative sphere. - Familiarize students with the conventional approach of operation of institutions in the public sector and should function. - Understanding of the different roles of human capital in the public sector. - Critical to address the various theories of the functioning of the public sphere.