

Standard 1. Structure of the study program

Study program doctoral academic studies Advanced Information Technology has all the elements stipulated by the Standard for Accreditation of the study program.

a. Name of the study program

The doctoral study program is titled Advanced Information Technologies. Upon completion, students earn the academic title of Doctor of Information Technology and Systems. The learning outcomes include acquiring knowledge and skills that empower students to conduct independent scientific research and contribute significantly to the advancement of the field.

The doctoral study program Advanced Information Technologies includes two study groups: Computer Simulations and Artificial Intelligence. According to the classification of the National Council for Higher Education (Official Gazette of RS No. 30/07), the Advanced Information Technology PhD program falls under the field of technical and technological sciences, specifically within Electrical and Computer Engineering.

b. Goals of the study program

The goal of the doctoral academic study program in Advanced Information Technology is to equip students with scientific competencies and academic skills in the field of information technology. This encompasses the development of creative problem-solving abilities, critical thinking, and the capacity for effective teamwork. Additionally, students will master the specific skills required for professional practice in this domain.

The goal of the study program is to educate highly skilled professionals capable of addressing information technology challenges using scientific methods. This includes the creation of models for technical and dynamic systems, computer simulations, artificial intelligence methods, and the latest advancements in modern information technologies.

One of the key objectives of this study program is to develop candidates' ability to formulate problems in advanced information technologies in a manner that is recognizable across related scientific disciplines. This approach establishes a critical scientific-methodological framework essential for solving highly complex issues fundamental to the analysis and synthesis of information technologies.

Another objective of the study program is to facilitate advanced teamwork on virtual platforms and enhance the ability to effectively communicate and present original research findings to the scientific community.

The integration of knowledge from various disciplines within this program is aimed at equipping students with the competencies necessary for their projected roles.

Type of studies:

Doctoral academic studies

c. Learning outcomes

The Doctoral Academic Studies (DAS) in Advanced Information Technology program equips students with comprehensive knowledge, skills, and competencies upon completion:

- to develop the capability for independent scientific and research endeavors,
- to address both practical and theoretical challenges and contribute to advancements in the field of information technologies,
- to actively participate in the international scientific projects within this domain,
- to contribute to the advancement of information technologies and provide critical assessments of existing ones based on acquired knowledge,
- to engage in critical thinking and, as future scholars, to operate with creativity and independence,

- to adhere to the principles of ethical conduct outlined in the code of good scientific practice,
- to effectively communicate research findings at a professional level, including publication in scientific journals and presentation of results at academic conferences
- to contribute to the advancement of various scientific disciplines relevant to information technologies, as well as to the broader field of science.

By completing the study program, students acquire the following competencies:

- comprehensive understanding and proficiency in advanced information technologies,
- proficiency in analyzing and developing advanced information technology using scientific methods and procedures,
- integrating knowledge from diverse scientific fields and applying it in advanced information technology,
- proficiency in keeping pace with the latest advancements in the field of advanced information technologies,
- honing skills in applying acquired knowledge to address practical challenges in analyzing and developing advanced information technologies.

The study program is tailored to meet the specific requirements of numerous companies operating in Serbia, with whom the Faculty of Business and Law has established business cooperation agreements.

d. Academic title

Upon successful completion of this study program, students are conferred the academic title of Doctor of Information Technology and Systems (PhD).

Admission requirements

Candidates who have accumulated a minimum of 300 ECTS credits through prior education in relevant undergraduate and master's academic programs are eligible to enroll in doctoral studies.

Candidates are selected for enrollment based on a competition announced and administered by the faculty.

List of compulsory and elective subjects

List of compulsory and elective subjects is provided in the table [Table 5.2](#).

The methodology of conducting study program and length of study program

Teaching process is conducted continuously over 6 semesters according to the established curriculum. The academic year is divided into two semesters, each spanning 15 weeks.

The grading criteria for each course are outlined in Table 5.2 and are aligned with the regulations stipulated in the Rulebook on Examination Administration and Grading.

Doctoral studies program consists of lectures, research study work, scientific research, and the preparation and defense of a doctoral dissertation. Students tailor their research focus by selecting relevant subjects that deepen their understanding of the field related to their dissertation topic. Elective courses are selected from a group of recommended courses within the study program. Additionally, students may, with their mentor's approval, opt for a specific number of courses from the doctoral studies in Advanced Information Technology offered by the Faculty of Business and Law at Union University - Nikola Tesla, or from another university domestically or internationally. Students also have the opportunity to undertake certain subjects during ERASMUS stays abroad as part of approved projects. However, adherence to the conditions outlined for attending classes in the chosen subject is mandatory. The subjects, whether compulsory or elective, can be taught in group settings or individually through mentoring. Group sessions are conducted if five or more students have selected a particular course or if the nature of the course necessitates such arrangement. Teaching arrangements are overseen by the Head of Doctoral Studies appointed by the Scientific Teaching

Council of the Faculty of Business and Law at Union University - Nikola Tesla.

Credit value of each subject expressed in ECTS credits

Doctoral academic studies in Advanced Information Technology span three years and are valued at a minimum of 180 ECTS credits. Of these, 90 ECTS are obtained by passing exams in subjects, 30 ECTS through an optional scientific research project encompassing the methodology and theoretical foundations of the doctoral dissertation, while 60 ECTS are earned through study and research work (30 ECTS) on the doctoral dissertation and the defense of the doctoral dissertation (30 ECTS). The point value of each subject, expressed in accordance with the European Credit Transfer System (ECTS), can be found in Table 5.1. This table includes the subjects, study research work on the doctoral dissertation, and the defense of the doctoral dissertation.

Credit value of doctoral dissertation preparation

The point value of the preparation and defense of a doctoral dissertation in doctoral academic studies is 60 ECTS points and is detailed in the table [Table 5.1](#)

The teacher mentors the student and assists in the preparation of the Doctoral Dissertation. The selection of topics for the Doctoral Dissertation is defined by the Rulebook on Doctoral Dissertations.

e. Requirements for enrolment in certain subjects or subject groups

Preconditions for enrolment in certain subjects are provided in Table 5.1 Requirements for each subject individually and Schedule of subjects per semesters and years of study are provided in Table 5.2.

requirements for transferring from other study programs

A student can transfer to this study program from other study programs in the same or related fields, provided they have passed exams that correspond to this study program and have achieved the required number of ECTS points for enrollment in the corresponding year. The decision regarding the relatedness of the field is made by the Scientific Teaching Council, such as the Commission appointed by the Dean or the Council.

f. Other important considerations regarding the study program:

Upon completion of the DAS Advanced Information Technology study program, students will have earned a total of 480 ECTS points. The program is conducted in the Serbian.

The curriculum specifies the subjects based on scientific and professional fields, their scheduling across years of study and semesters, the weekly and annual/semester number of teaching hours, as well as the overall duration of studies.

The study program is delivered through lectures (L), exercises (E), study and research work (SRW), participation in scientific research projects, and the preparation and defense of a doctoral dissertation. Candidates refine their research focus by selecting subjects that align with the topic of their doctoral dissertation.

Subjects, whether compulsory or optional, are offered as group or individual (mentoring) sessions. Group classes are conducted if five or more students enroll in a course, or if the nature of the course necessitates such arrangement.

The emphasis in the doctoral study program is on the candidate's independent study and research work, which is verified through accompanying scientific research projects culminating in the doctoral dissertation.

Exams and student evaluations are conducted in the manner and according to the procedures established by the general regulations of the faculty.

A student who has not successfully completed a compulsory subject by the beginning of the next school year must re-enroll in and pass the same subject in the following school year. If a student has not successfully

completed an elective subject, they have the option to either re-enroll in the same subject or choose a different elective subject.

Standard 2. Purpose of the study program

2.1. The purpose of the study program is to educate students to become capable of conducting high-quality and independent scientific and research work, in accordance with the needs of society.

The purpose of the DAS Advanced Information Technology study program is to educate PhD students with the necessary scientific, professional, and practical competencies in this field. The program is designed to ensure the acquisition of skills related to computer simulations of dynamic and technical systems, as well as artificial intelligence, in both production and service sectors, aiming to produce outcomes that are socially justifiable and beneficial.

2.2. On the other hand, the development of new technologies and procedures that contribute to the overall advancement of society is facilitated through the education of professionals capable of critically evaluating the research work of others and independently conducting original, scientifically relevant research. The purpose of the study program includes the application and development of scientific methods, models of dynamic and technical systems, modern programming languages, computer simulations, and the implementation of artificial intelligence methods. By training professionals in this field, a critical mass of researchers will be formed, capable of creating new scientific and technical solutions in the field of advanced information technology, which is imperative for progress in any social environment.

The motivation for introducing this doctoral study program includes, among other factors, the significant interest in similar study programs observed at both state and private faculties in Serbia.

The automation of production and recent changes on both global and local markets, driven by the widespread application of advanced information technologies and the Internet as a communication tool, as well as the extensive use of web applications in business (ranging from individuals and organizations to the state itself), justify the existence of this study program.

Information technology is the cornerstone of modern business processes.

2.3. Study program's objectives are well-aligned with the faculty's overarching goals. Introducing a doctoral program in Advanced Information Technology is not just a response to the increasing student interest but also a strategic step to meet the evolving demands of the industry. This proactive approach ensures that both students and the industry benefit from cutting-edge research and expertise in this rapidly advancing field. Meeting the demand for doctoral academic studies in this field is a crucial strategic objective for the faculty. With significant student interest in programs of this nature and ample material and personnel resources, the faculty is well-positioned to deliver high-quality education in this area.

Standard 3. Goals of the study program

The aim of the doctoral academic studies program in Advanced Information Technology is to equip students

with scientific competencies and academic skills in the field. This encompasses fostering creative problem-solving abilities, promoting critical thinking, cultivating teamwork skills, and mastering the specialized expertise necessary for professional practice.

The objective of the study program is to educate highly proficient scientific professionals capable of addressing advanced information technology issues through theoretical analysis, mathematical models of technical and dynamic systems, and the application of modern programming languages in computer simulations and artificial intelligence methods.

An essential aim of this study program is to equip candidates with the capability to address challenges present in technical and dynamic systems within our environment. This involves applying computer simulations and artificial intelligence methods in a manner that resonates with other relevant scientific disciplines.

The program emphasizes the importance of multidisciplinary knowledge and intellectual skills. It encompasses statistical analysis, modeling, simulation techniques, discrete optimization, and artificial intelligence applications. This comprehensive approach provides a critical scientific and methodological foundation essential for tackling highly intricate problems inherent in the analysis and synthesis of advanced information technologies.

The study program's objectives are aligned with contemporary trends of development of information technology worldwide. The study program aims to cultivate experts with profound knowledge that resonates with the current trajectories of scientific disciplines worldwide. An additional objective, in accordance with the Faculty of Business and Law's educational aims, is to foster students' understanding of the importance of their individual contributions to societal advancement.

The specific aim of this study program is to equip students with the capability for practical and innovative problem-solving within the field of designing and implementing software applications, alongside adept management of intricate information technologies in alignment with evolving theoretical and practical requirements. Moreover, the program endeavors to educate experts proficient in teamwork, while also nurturing their capacity to effectively communicate and present original findings to the scientific community.

The objectives of the doctoral academic studies program in Advanced Information Technology align with the fundamental tasks and objectives of the Faculty of Business and Law at Union-Nikola Tesla University. They serve as an extension of the goals outlined in the corresponding master's and undergraduate programs within the same faculty.

Standard 4: Students' competencies

4.1. The Advanced Information Technology doctoral study program aims to equip students with the knowledge, skills, advanced capabilities, and competencies necessary for their professional development and success upon graduation. They will be able to:

- a. Independently solve practical and theoretical problems within their specialized field, conducting and managing development projects and scientific research;
- b. Contribute to international scientific projects by conducting original research that advances the boundaries of knowledge, validated through publications in reputable scientific journals, establishing themselves as references both nationally and internationally;
- c. Develop novel technologies and methodologies within their respective fields, leveraging cutting-edge knowledge and research methods in information technology and systems;
- d. Exhibit critical thinking, creativity, and independence, adept at analyzing, evaluating, and synthesizing new and intricate concepts;

- e. Uphold the principles of ethical conduct in scientific practice, demonstrating an ability to uphold academic integrity throughout the research process;
- f. Communicate effectively at a professional level, transferring research findings to colleagues, the broader academic community, and society as a whole;
- g. Effectively communicate scientific research results at professional conferences and through publication in scientific journals, patents, and innovative technical solutions. They are proficient in promoting technological advancement within academic and professional spheres;
- h. Contribute to the advancement of various scientific disciplines relevant to advanced information technologies and broader scientific fields. They possess the capability to conceive, design, and implement innovative solutions.

By completing doctoral academic studies in Advanced Information Technology, students acquire a comprehensive set of knowledge, skills, attitudes, and motivational dispositions essential for exemplary professional performance.

4.2. By mastering the study program, students acquire the following subject specific competencies:

- i. profound understanding of the principles and operations of advanced information technologies,
- j. capability to address specific challenges in advanced information technologies through scientific methodologies and procedures,
- k. integrating fundamental knowledge from diverse scientific domains and applying it to analyze, develop, and synthesize advanced information technologies and systems,
- l. keeping abreast of contemporary advancements in the scientific domain, including designing, developing models, and employing software tools. Proficiency in advanced programming and staying updated on modern advancements in computer simulations of dynamic and technical systems, as well as the application of artificial intelligence methods.
- m. cultivating proficiency and adeptness in applying acquired knowledge to solve practical problems, mathematical modeling, and conducting computer simulations of dynamic and technical systems, along with the application of artificial intelligence methods.
- n. leveraging information and communication technologies for mastering knowledge and managing processes and systems within information technologies.

4.3. The competences acquired through mastering the study program enable students to advance their professional development in fields such as science, education, economy, and the public sector.

The student possesses advanced theoretical and practical knowledge necessary for critically analyzing and researching fundamental and applied aspects of information technology, aiming to expand and redefine existing knowledge, science, or professional practices.

The students apply advanced and specialized skills and techniques to address key research challenges, contributing to the expansion and redefinition of existing knowledge or professional domains. They demonstrate innovation, scientific rigor, and professional integrity in their work.

The students design, analyze, and execute research projects that make substantial and original contributions to both general knowledge and professional practice. They adeptly manage interdisciplinary and multidisciplinary projects, demonstrating the ability to initiate national and international collaborations in science and development.

Acquired competencies are further validated through scientific publications. Prior to receiving the diploma for completed studies, the candidate must publish (or provide proof of acceptance for publication) a minimum of 2 (two) works of M54 rank (as per the categorization of the Ministry of Science), along with at least one publication in a journal listed in the SCI index.