**IOSUD: UNIVERSITY OF CRAIOVA**
**SCHOOL OF DOCTORAL STUDIES**
**„C-TIN BELEA”**
**FACULTY OF AUTOMATION, COMPUTERS AND ELECTRONICS**
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# SELF-EVALUATION REPORT

## DOMAIN OF DOCTORAL STUDIES: *COMPUTERS AND INFORMATION TECHNOLOGY*

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**Endorsed by**
**the Quality Assurance Committee of the University of Craiova (CEAC-UCV)**
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# 1. General information

## 1.1. School of Doctoral Studies ”Constantin Belea”

The doctoral field of *Computers and Information Technology* belongs to the ***S**chool of **D**octoral Studies "**C**onstantin **B**elea" (**SDCB**)* of the Faculty of Automation, Computers and Electronics (ACE) within the University of Craiova (Ucv).

**Establishment:** The university education of automation and computers has a long and rich tradition within the University of Craiova. The beginning dates from the academic year 1966 - 1967, with the establishment of the Automation specialization. From the academic year 1976 - 1977, with the new curriculum, two options appeared in the Automation department: the Automation option and the Computers option, and the specialization changed its name to Automations and Computers. The primordial, visionary role in the development of the specialization of Automation and Computers belonged to the late professor doctor engineer Constantin Belea, the founder of the School of Automation from Craiova. Regarding the beginnings of the doctoral field *Computer and Information Technology*, they can be placed in 1994, the year in which Mr. Professor Mircea Petrescu obtained the quality of doctoral supervisor in *Computers* at the University of Craiova, under whose coordination was defended in 2002 and the first doctoral thesis in this field, at the University of Craiova (PhD student Liana Stănescu). In the extended field of *Computers and Information Technology*, professors Costin Bădică and Mihai Mocanu obtained the quality of PhD supervisor in 2007, professor Dumitru Dan Burdescu in 2008, and in 2018, professor Elvira Popescu obtained the certificate of habilitation in the field of study mentioned above, being affiliated in the same year to the *School of Doctoral Studies "Constantin Belea"*.

**Structure and evolution**: In its current structure, the School of Doctoral Studies "Constantin Belea" appeared within the University of Craiova by regrouping in a single doctoral school the three doctoral fields of Systems Engineering, Computers and Information Technology, Mechatronics and Robotics within the Faculty of Automation, Computers and Electronics, in accordance with the provisions of the National Education Law no. 1/2011 and as an effect of H.G. no. 681/2011 regarding the Code of Doctoral Studies. Initially, the three fields of study functioned within the Doctoral School of Engineering Sciences (Anexa 1.1_1. Decizia de infiintare SD–SI), later they split into a separate doctoral school, directly subordinated to IOSUD - University of Craiova, by the decision of the University Senate from 29.09.2015 (Anexa 1.1_2. Decizia de infiintare SDCB) endorsed by the Ministry of Education (Anexa 1.1_3. Ordinul nr.5382 din 17.11.2016).

Although young, the School of Doctoral Studies "Constantin Belea" had first-rate pioneers in the field of Automation. In 1968, Professor Dr. Doc. Constantin Belea obtained the quality of PhD supervisor at the University of Craiova in the field of Automatic Systems. In the period since this historical event, the doctoral activity has known a continuous development, many of the teachers of the Automation and Computers obtaining the title of Doctor Engineer under the guidance of Professor Constantin Belea. The first doctoral thesis in Automatic Systems was defended in 1974 by Professor Mircea Ivănescu - the future rector of the University of Craiova, obtaining his PhD

in 1975. The number of PhD supervisors has increased substantially since 1989. Those who have obtained the quality of PhD supervisor are:

- in 1993, in the field of Automatic Systems, professors Vladimir Răsvan, Mircea Ivănescu, Matei Vînătoru
- in 1994, in the field of Computers, Mr. Professor Mircea Petrescu (within the University of Craiova, he was already a PhD supervisor at the Polytechnic University of Bucharest)
- in 2005, in the field of Automatic Systems, Professor Marin Constantin
- in 2007, in the field of Computers and Information Technology, professors Costin Bădică and Mihai Mocanu
- in 2008, in the field of Mechatronics and Robotics, professors Dorian Cojocaru, Nicu George Bîzdoacă and Mircea Nițulescu
- in 2008, in the field of Systems Engineering, professors Dan Popescu and Emil Petre, and in the field of Computers and Information Technology professor Dumitru Dan Burdescu
- in 2016, in the field of Systems Engineering, Professor Dan Selișteanu obtained the habilitation certificate, being affiliated in the same year to the Doctoral School "Constantin Belea"
- in 2018, in the field of Computers and Information Technology, Miss Professor Elvira Popescu obtained the habilitation certificate and was affiliated to the Doctoral School "Constantin Belea"
- in 2018, in the field of Systems Engineering, Professor Monica Roman and Professor Dorin Șendrescu defended their habilitation theses, being confirmed and affiliated in 2019 to the doctoral school
- in 2019, in the field of Systems Engineering, Mrs. Professor Daniela Danciu obtained the habilitation certificate, being affiliated in the same year to the Doctoral School "Constantin Belea".

Currently, the *School of Doctoral Studies "Constantin Belea"* organizes doctoral studies in the fields of *Systems Engineering*, *Computers and Information Technology*, *Mechatronics and Robotics*. The activity is coordinated by the Council of Doctoral School (CSD), consisting of five members and structured as follows:

A. PhD supervisors from the School of Doctoral Studies “Constantin Belea”:

1. Prof. Univ. Dr. Ing. Costin Bădică – *Director of the School of Doctoral Studies “Constantin Belea”*, PhD supervisor in *Computers and Information Technology*
2. Prof. Univ. Dr. Eng. Dorian Cojocaru, PhD supervisor in *Mechatronics and Robotics*
3. Prof. Univ. Dr. Eng. Daniela Danciu, PhD supervisor in *Systems Engineering*

B. External members:

1. Dr. Silviu Niculescu, Professor of Control Systems, L2S-CENTRALESUPELEC, France, Web: https://l2s.centralesupelec.fr/u/niculescu-silviu-iulian/

C. Students:

1. Drd. Radu Lucian Constantinescu, PhD student in the field of *Systems Engineering* at the School of Doctoral Studies "Constantin Belea".

**The research mission** of the *School of Doctoral Studies "Constantin Belea"* derives from the mission of IOSUD and the University of Craiova, and considers the training of specialists - researchers in the fields of *Systems Engineering*, *Computers and Information Technology*, *Mechatronics and Robotics*, by satisfying the desire for intellectual, professional and social development, but also the need for specialized workforce of society, and by promoting excellence in scientific research, development and innovation. *School of Doctoral Studies "Constantin Belea"* had in the period 2016-2021 a number of 15 **graduates of doctoral studies**, distributed as follows:

- Systems Engineering - 7 graduates
- Computers and Information Technology - 5 graduates
- Mechatronics and Robotics - 3 graduates.

There are over 20 theses in progress in all three fields: Systems Engineering, Computers and Information Technology, Mechatronics and Robotics. All theses defended in our doctoral school have been confirmed by CNATDCU (the last one, defended in December 2020, is being confirmed). This intense scientific activity has resulted in the publication in the last 5 years, by the PhD students of the School of Doctoral Studies, alone or in collaboration, of over 150 articles in journals and volumes of ISI listed conferences and over 100 articles in journals and volumes of conferences indexed in international databases.

**Level of quality certification:** In Romania, there were 97 universities in operation in 2021 (of which 7 were in liquidation): 54 public universities (including the military ones) and 43 private universities (of which 9 provisionally authorized). The University of Craiova is a traditional university and the first institution of this type in the regional plan, constantly ranked among the top 8-10 universities in Romania: among the top 8 universities in Romania (LOI - Level One Institutions), in the 2000s, among the top 10 universities in Romania in 2020 and 2021 in the **uniRank** ranking (https://www.4icu.org/ro/ ), which lists 78 Romanian universities. The ranking is given by online, objective indicators: the authority of online domains, the accreditation of institutions, the educational offer and the preference for *face-to-face* education (for details see https://www.4icu.org/reviews/3936.htm).

In 2009 the University of Craiova went through the process of periodic institutional evaluation by ARACIS for the first time, and following the evaluation, the ARACIS Council issued the Certificate by which it was awarded the grade "*High degree of trust*", the documents being available on the website https: https://www.aracis.ro/ev_institutionala/universitatea-din-craiova-2009/.

In 2011, following the independent evaluation (National Research Evaluation Exercise - ENEC) led by UEFISCDI through a project financed from structural funds, the University of Craiova obtained very good results in the evaluation of research and doctoral programs. Within the engineering fields of study where the classification was made, the University of Craiova occupied very good positions (in the field P17: *Systems Engineering* - 5th place, field P18: *Computers and Information Technology* - 5th place, field P7: *Mechanical and Mechatronics Engineering* - 7th place).

In 2012, with the support of a project funded by structural funds "Performance in research, performance in teaching quality, diversity and innovation in Romanian universities", coordinated by UEFISCDI, the University of Craiova was evaluated externally institutionally internationally and by the Association of European Universities (EUA) through the Institutional Evaluation Program (IEP) included in the European Register of Quality Agencies, https://cis01.central.ucv.ro/eval_internationala/# .

In 2015, the University of Craiova was institutionally evaluated by ARACIS again, and following the external quality evaluation report, available on the https://www.aracis.ro/ev_institutionala/universitatea-din-craiova-2015/ , the ARACIS Council gave it the grade *"High degree of trust"*.

Regarding the level of quality certification in the Faculty of Automatics, Computers and Electronics, on the structure of which the School of Doctoral Studies “Constantin Belea” was reorganized in 2015, we mention that in the period 2015-2019 all 7 bachelor's degree programs of the Faculty of Automation, Computers and Electronics were externally evaluated by ARACIS, all obtaining the maintenance of accreditation, and in some of them the schooling capacity has increased. In the Faculty of Automatics, Computers and Electronics there are 6 master's programs, within the 3 fields of study of the faculty, for which in 2019 the procedure of periodic external evaluation by ARACIS of the master's fields of study was performed, all obtaining the maintenance accreditation.

**Specific measures for quality management and promotion of ethics and deontology, implemented at the level of the doctoral school:** The internal quality assurance system is in accordance with the one provided in the *Regulation of the School of Doctoral Studies "Constantin Belea"* (Anexa A.1.1.1_1. Regulament SDCB) as well as with the Internal Evaluation Procedure of the doctoral schools of IOSUD University of Craiova (Anexa C.1.1.1_1. Procedura de evaluare interna si de monitorizare IOSUD_UCV). The *SDCB* director makes an annual self-evaluation report, which is presented to the General Assembly of Doctoral Supervisors and submitted to the approval of the SDCB Council. This evaluates annually the efficiency of internal quality assurance procedures and structures, as well as their impact on activities in doctoral studies. The conclusions of the annual quality self-assessment report at the level of the *School of Doctoral Studies "Constantin Belea"* are analyzed in the General Assembly of Doctoral Supervisors in order to identify problems and solutions for continuous quality improvement at the level of *SDCB*.

The policy of internal quality assurance and monitoring at the level of the *School of Doctoral Studies "Constantin Belea"* is transparent, being implemented according to this regulation which includes in its articles clear and quantifiable criteria to be met for the PhD supervisors, PhD students and research results.

Internal quality assurance at the level of SDCB and its monitoring is carried out by specific measures provided in the *Regulation of organization, operation and internal quality assurance at the level of the School of Doctoral Studies “Constantin Belea”*( Anexa A.1.1.1_1):

- periodic evaluation of the PhD supervisors from SDCB, according to *Art 3, par. (3) - (6).*

- periodic evaluation of the quality of the proposed doctoral study programs, according to. *Art. 7 and Art 9 par. (1), (2), (6) and (7).*
- periodic evaluation of the quality of the students' research activity, according to *Art. 4, Art. 7 par. (5), Art. 8, Art. 9 par. (1), (3), (4), (6).*
- periodic evaluation of the quality of the research results carried out by PhD students, accoring to *Art 9 par. (1), (4), (5), (6), Art 10, Art 11*.

The regulation is closely related to the quality assurance system and management at the level of the University of Craiova, according to *Art. 1 par. (3) and (4).*

These mechanisms are exemplified by the annual evaluation reports for 2016 (Anexa 1.1_2016. Raport de autoevaluare SDCB 2016), 2017 *Anexa 1.1_2017. Raport de autoevaluare SDCB 2017*), 2018 (Anexa 1.1_2018. Raport de autoevaluare SDCB 2018), 2019 (Anexa 1.1_2019. Raport de autoevaluare SDCB 2019), and 2021 (Anexa 1.1_2021. Raport de autoevaluare SDCB 2019), presented by the director of the doctoral school in CSD (for approval) and later in the General Assembly of Doctoral Supervisors (for approval) and in the General Assembly of the ACE Faculty (informative presentation ).

For 2020, the presentation was made online and has been integrated into this document.

**Human resources and existing research infrastructure at the doctoral school:** Within the SDCB of IOSUD-UCv, 11 PhD supervisors and over 35 PhD students are currently working, of which 4 are from other countries such as Iraq, Vietnam, etc.

Data on **PhD supervisors** certified and active in the academic year 2020-2021 at the level of the doctoral school, all tenure at the Faculty of Automation, Computers and Electronics (FACE), are presented in table 1.1.a, they are extracted by us from Anexa 1.1_4. Conducatori de doctorat afiliati IOSUD and subsequently confirmed by the Human Resources service, in accordance with Anexa A.3.1.2. Membri SDCB titulari Ucv.

**Table 1.1.a.** List of PhD supervisors of SDCB

| Nr. crt. | Surname | Name | Tenured teacher | Order / date of attestation |
|---|---|---|---|---|
| **1. Computers and Information Technology** | | | | |
| 1. | Costin | BĂDICĂ | FACE, University of Craiova | 1805 / 20.08.2007 |
| 2. | Mihai Lucian | MOCANU | FACE, University of Craiova | 1805 / 20.08.2007 |
| 3. | Elvira | POPESCU | FACE, University of Craiova | 3379 / 22.03.2018 |
| **2. Systems Engineering** | | | | |
| 4. | Dan | POPESCU | FACE, University of Craiova | 3292 / 26.02.2008 |
| 5. | Dan | SELIȘTEANU | FACE, University of Craiova | 4010 / 07.06.2016 |
| 6. | Monica | ROMAN | FACE, University of Craiova | 3821 / 01.04.2019 |

| | | | | |
|---|---|---|---|---|
| 7. | Gheorghe-Dorin | ŞENDRESCU | FACE, University of Craiova | 3822 / 01.04.2019 |
| 8. | Daniela | DANCIU | FACE, University of Craiova | 4105 / 28.05.2019 |
| **3. Mechatronics and Robotics** | | | | |
| 9. | Nicu George | BÎZDOACĂ | FACE, University of Craiova | 5842 / 04.11.2008 |
| 10. | Dorian | COJOCARU | FACE, University of Craiova | 5842 / 04.11.2008 |
| 11. | Mircea | NIȚULESCU | FACE, University of Craiova | 5842 / 04.11.2008 |

A number of **5** of the **11** PhD supervisors received the right of doctoral supervision following the habilitation in the field, **4** of them after the issue of OMENCS no. 6129 / 20.12.2016. Two of the PhD supervisors are members of the CNATDCU commissions, both in *Commission 15. Computers, Information Technology and Systems Engineering* (Costin Bădică and Dan Selișteanu), and 5 PhD supervisors hold management positions within the university.

The distribution of the 11 active PhD supervisors, affiliated to the domains of *Systems Engineering* (5), *Computers and Information Technology* (3), respectively *Mechatronics and Robotics* (3), together with the evolution of the number of PhD students they coordinate, during the reference period (academic year 2016-2017 until 2021-2022) is presented in table 1.1.b., the compilation of this statistic being based on the student record program (https://cis01.central.ucv.ro/evstud/ ).

**Table 1.1.b.** Active PhD supervisors / number of PhD students at the School of Doctoral Studies "Constantin Belea"

| Domain | PhD Supervisor | No.students 2016-2017 | No.students 2017-2018 | No.students 2018-2019 | No.students 2019-2020 | No.students 2020-2021 | No.students 2021-2022 |
|---|---|---|---|---|---|---|---|
| *Systems Engineering* | Daniela Danciu | - | - | - | - | - | - |
| | Dan Popescu | 2 | 2 | 1 | - | - | - |
| | Monica Roman | - | - | - | - | 1 | 3 |
| | Dan Selișteanu | 1 | 1 | 6 | 8 | 10 | 7 |
| | Dorin Șendrescu | - | - | - | 1 | 3 | 7 |
| | Others (inactiv) | 4 | 2 | - | 1 | | - |
| *Computers and Information Technology* | Costin Bădică | 6 | 7 | 9 | 8 | 7 | 6 |
| | Mihai Mocanu | 6 | 5 | 5 | 6 | 2 | 4 |
| | Elvira Popescu | - | - | 2 | 3 | 2 | 2 |
| | Others (inactive) | 2 | 2 | - | - | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Mechatronics and Robotics* | Nicu Bîzdoacă | 7 | 6 | 7 | 5 | 5 | 7 |
| | Dorian Cojocaru | - | 1 | 2 | 2 | 2 | 5 |
| | Mircea Nițulescu | 1 | 2 | 2 | 2 | 1 | 1 |
| | Others | - | - | - | - | 1 | - |

PhD students carry out their research activity in laboratories with modern equipment, within the ACE Faculty or at INCESA. For the research infrastructure, the School for Doctoral Studies Constantin Belea has the logistical support of the Research Centers assigned to each of its composite fields of study, of *the Research Infrastructure in Applied Sciences* - INCESA placed in its immediate vicinity and of the teachers from the Faculty of Automation, Computers and Electronics, some of them members of the doctoral advisory committee. At the same time, SDCB benefits from the educational infrastructure of the ACE Faculty, which consists of lecture, seminar and laboratory rooms adequate for the development of teaching activities within SDCB. The research activity within SDCB is carried out in close connection with the research activity within the Faculty of Automation, Computers and Electronics of the University of Craiova. This activity has the support of the Research Centers assigned to the fields of the faculty and of the SDCB. At the level of the Faculty of Automation, Computers and Electronics of the University of Craiova, in the period 2016-2021, the following Research Centers were active:

- Nonlinear automation, stability and oscillations (ANSO), in the field of study Systems Engineering, certified by CNCSIS on 11.02.2001 and re-certified on 12.09.2006 (Anexa 1.1_5. Certificatele nr.19/CC-B/2001 și nr.10/2006)
- Development of multimedia applications (DAM), in the field of study Computers and Information Technology, accredited by CNCSIS on 12.09.2006 (Anexa 1.1_6. Certificat nr.15/2006)
- Mechatronics and Robotics (CCMR), in the field of study Mechatronics and Robotics.

Details on the research infrastructure in the fields of Computers and Information Technology, Systems Engineering and Mechatronics and Robotics are presented in Section 2 of this report.

**Elements of educational effectiveness at the level of the doctoral school:** PhD students who obtained their doctorate at the University of Craiova during 2011-2020, under the assistance of the PhD supervisors who are currently tenured teachers of SDCB, are currently working in academia, research institutes or companies in the doctoral field of study, as follows:

**Table 1.2**. The field of activity of the graduates of doctoral studies at SDCB, 2011-2020

| **Graduate** | **PhD Supervisor** | **Graduation Year** | **Doctoral field of study/ Activity field / other details** |
|---|---|---|---|
| Poteraș Cosmin Marian | Mihai Mocanu | 2011 | CTI / University (Assistant) 2011-2016<br>Companies in the field of study 2016-2020<br>Romanian Senate 2020-2024 |
| Scafeș Mihnea | Costin Bădică | 2011 | Companies in the field of study 2016-2020 |
| Muscar Alexandru | Costin Bădică | 2012 | CTI/ Companies in the field os stsudy (Anglia) |
| Mihai Gabriel | Dan Burdescu | 2012 | CTI |

| | | | |
|---|---|---|---|
| Ilie Viorel Sorin | Costin Bădică | 2013 | CTI/ University (Lecturer) 2011-present / University of Craiova, Dept. Computers and IT |
| Popa Radu Teodoru | Mihai Mocanu | 2013 | CTI/ University (Lecturer) 2018-present / University of Craiova, Dept. Computers and IT |
| Mohammad Abdullah Al Odat | Mihai Mocanu | 2015 | CTI/ University (Lecturer)/ Oman, Sur, Sur University College, Information Systems and Technology Dept., 2018-present |
| Faiq Baji | Mihai Mocanu | 2018 | CTI/ University (Lecturer)/ Iraq, Bagdad, Al Mustansiriya University, Dept. of Computer Engineering, 2018-prezent |
| Mancaș Cătălina Felicia | Mihai Mocanu | 2018 | CTI/ University (Lecturer) 2013-present / University of Craiova, Dept. Computers and IT |
| Popescu Paul Ștefan | Mihai Mocanu | 2019 | CTI/ University (Assistant) 2017-prezent/ University of Craiova, Dept. Computers and IT |
| Becheru Alexandru | Costin Bădică | 2019 | CTI/ Univeristy (Assistant) 2015-2018/ University of Craiova, Dept. Computers and IT IT Companies 2018-2020 |
| Constantinov Călin | Mihai Mocanu | 2020 | CTI/ University (Assistant) 2015-2018/ University of Craiova, Dept. Computers and IT IT Companies 2018-2020 |
| Dicu I. Gheorghe Doru | Matei Vînătoru | 2015 | IS/ IT Company |
| Matei C. Lucian | M.Vînătoru/E.Petre | 2016 | IS/ University |
| Șoimu A. Andreea - Valentina (Iacob) | Vladimir Răsvan | 2016 | IS/ University |
| Nguyen Van Dong Hai | Mircea Ivănescu | 2018 | IS/ University |
| Lorincz Ş. Alexandra-Elisabeta | Dan Selişteanu | 2019 | IS/ IT Company |
| Popa E. Bogdan | Dan Popescu | 2019 | IS/ University |
| Monea F. Bogdan-Florian | Emil Petre | 2020 | IS/ Research institute |
| Banța V. Viorel Costin | Dorian Cojocaru | 2015 | MR/ University |
| Gîlcă S. Gheorghe | Nicu Bîzdoacă | 2016 | MR/ University |
| Mănoiu-Olaru Sorin | Mircea Nițulescu | 2013 | MR/ IT Company |
| Ionescu Marian | Nicu Bîzdoacă | 2020 | MR/ University |

## 1.2 Doctoral field of study Computers and Information Technology

**The mission** is to contribute to the development of highly specialized human resources for research, development and innovation, competent in the field of *Computers and Information Technology*, by ensuring the appropriate framework for conducting high-performance scientific research and obtaining valuable scientific results, and by promoting research ideas in the economic-social and academic environment at regional, national and international level. In order to fulfill this mission, a series of **objectives** and main directions in scientific research are pursued, in close relation with:

- promoting excellence in research;
- continuous development of the research infrastructure;
- establishing sustainable partnerships with economic agents on various national and international research projects;
- promoting the innovative ideas of the PhD students among the economic agents;

- promoting and supporting our high quality publications and developing openness for the scientific community in the country and abroad;
- encouraging PhD students to publish in top journals in each field;
- strengthening the dimension of international cooperation by signing new collaboration protocols within IOSUD;
- periodic evaluation of the results of the scientific research within SDCB.

The training program based on advanced university studies combines the advanced training component with that of scientific research. **The curriculum** in the field of doctoral studies *Computers and Information Technology* includes disciplines that aim to address, in a unitary context, traditional, fundamental issues, but also new developments, being thus related to the mission of training researchers, capable of conducting high-level research in the context of the application of rigorous scientific methods and capitalize research results through projects, publication and communication, all in accordance with the principles of academic ethics and integrity, research ethics and intellectual property rights. As shown in Anexa A.3.1.3_1. Planuri de invatamant SDCB 2016-2021, as well as from Anexa A.3.1.3_2. Fise discipline, the curriculum is flexible and regularly updated in accordance with the specific news to the field of research and the requirements of each generation of PhD students. For the field of study subject to evaluation, we present here a projection of the new curriculum 2021-2022.

**Table 1.3.** Curriculum for the academic year 2021-2022 for the doctoral field of studies *Computers and Information Technology*

| **CONTENT OF THE CURRICULUM** | | | | | |
|---|---|---|---|---|---|
| **YEAR I - SEM I**<br>**I.TRAINING PROGRAM BASED ON ADVANCED UNIVERSITY STUDIES** | **Form of verification** | **Grading method** | **Allocated hours** | | **Credits** |
| | | | C | S | |
| **A. Disciplines in the common core** | | | | | |
| 1. *Methodology of Scientific Research* | Examination | Grade | 1 | 0 | 3 |
| 2. *Ethics and Academic Integrity* | Examination | Grade | 1 | 0 | 3 |
| **B1. Disciplines in the field of "Computers and Information Technology"** | | | | | |
| 1. *Algorithms Analysis and Design* | Examination | Grade | 2 | 1 | 6 |
| 2. *Computer Networks* | Examination | Grade | 2 | 2 | 6 |
| 3. *Artificial Intelligence* | Examination | Grade | 2 | 1 | 6 |
| 4. *Multi-Agent Systems* | Examination | Grade | 2 | 1 | 6 |
| 5. *Data Modeling and Analysis* | Examination | Grade | 2 | 1 | 6 |
| 6. *Parallel Computing* | Examination | Grade | 2 | 1 | 6 |
| 7. *Machine Learning* | Examination | Grade | 2 | 2 | 6 |
| *8. Web Systems and Technologies* | Examination | Grade | 2 | 1 | 6 |
| *9. Human Computer Interaction* | Examination | Grade | 2 | 1 | 6 |
| *10. Computer Vision* | Examination | Grade | 2 | 1 | 6 |
| **TOTAL CREDITS YEAR I/SEM I** | | | | | **30*** |

| | |
|---|---|
| **II. SCIENTIFIC RESEARCH PROGRAM - SEM.II** | |
| **A. Presentation of the proposal of the scientific research program**<br>1. *Scientific research report R0* | **15**<br>15 |
| **B. Presentation of the progress of the scientific research program**<br>1. *Scientific research report R1* | **15**<br>15 |
| **TOTAL CREDITS YEAR II** | **60** |
| **YEAR II** | |
| **SCIENTIFIC RESEARCH PROGRAM** | |
| **A. Presentation of the progress of the scientific research program**<br>1. *Scientific research report R2*<br>2. *Scientific research report R3* | **30**<br>15<br>15 |
| **B. Dissemination of scientific research results *****<br>The 30 credits can be obtained from scientific publications in specialized journals, respectively in the volumes of some scientific conferences (doubled by the participation in the respective conference), as follows:<br>- ISI Indexed Journal and ISI indexed conference volume<br>- BDI Indexed Journal * and BDI indexed conference volume<br>- Research report necessary only when it is necessary to promote in an additional year | **30**<br><br><br><br>15<br>15 |
| **TOTAL CREDITS YEAR III** | **60** |
| **YEAR III** | |
| **SCIENTIFIC RESEARCH PROGRAM** | |
| **A. Dissemination of scientific research results *****<br>The 30 credits can be obtained from scientific publications in specialized journals, respectively in the volumes of some scientific conferences (doubled by the participation in the respective conference), as follows:<br>- ISI Indexed Journal and ISI indexed conference volume<br>- BDI Indexed Journal * and BDI indexed conference volume<br>- Research report necessary only when it is necessary to promote in an additional year | **30**<br><br><br><br>15<br>15 |
| **B. Writing, evaluating and defending the doctoral thesis before the Guidance Commission** | **30** |
| **C. Defending the doctoral thesis before the Specialized Commission** | |
| **TOTAL CREDITS YEAR III** | **60** |
| **TOTAL CREDITS YEAR I+II+III** | **180** |

**Remarks**: The promotion requirement in the following year of doctoral studies is the submission of at least one research report in the current year (according to GD 681/2011, art.64) and the accumulation of a minimum number of 30 credits.

* The 30 credits can be obtained by choosing the subjects from the common core (6 credits) and other disciplines from the field of doctoral university studies in which the PhD student is enrolled (24 credits).

** According to the Order of the Minister of National Education and Scientific Research no. 6.129 / 2016 on the approval of the minimum required and mandatory standards for the award of teaching degrees in higher education, the following international databases are recognized: ISI Web of Science, Scopus, IEEE Xplore, ScienceDirect, Elsevier, Springerlink, ACM, DBLP, EURASIP, Wiley, Inspec.

*** According to the Order of the Minister of National Education no. 5510/2018,a part of the credits obtained by disseminating the results of scientific research must be obtained from publications and / or patents that meet the minimum national standards necessary and mandatory for conferring the scientific title of doctor, approved in the Senate meeting of the University of Craiova on 27.09.2018. At least two articles must be published / accepted for publication (with proof of acceptance) in Web of Science

indexed journals, and the PhD student must be the first author. One of these two articles can be equated with a patent, the PhD student being the first author.

As we specified in the previous section, out of the 11 active doctoral supervisors, affiliated to the fields of the doctoral school, 3 belong to the field of *Computers and Information Technology*.

**Table 1.4.a.** List of current (active) PhD supervisors in the School for Doctoral Studies “Constantin Belea”, in the field of study Computers and Information Technology.

| **Nr. Crt.** | **Surname** | **Name** | **Affiliation** | **Order/ affiliation date** |
|---|---|---|---|---|
| 1. | Costin | Bădică | School of Control, Computer Science and Electronics, University of Craiova | 1805 / 20.08.2007 |
| 2. | Mihai Lucian | Mocanu | School of Control, Computer Science and Electronics, University of Craiova | 1805 / 20.08.2007 |
| 3. | Elvira | Popescu | School of Control, Computer Science and Electronics, University of Craiova | 3379 / 22.03.2018 |

**Table 1.4.b** List of active PhD students of the School of Doctoral Studies "Constantin Belea", in the field of Computers and Information Technology.

| **Nr. crt.** | **PhD Student** | **Supervisor** | **Enrollment year** |
|---|---|---|---|
| **1** | Ferenczi Andras-Levente | Prof.univ.dr.ing. Costin Bădică | 2021 |
| **2** | Ion Teo Cristian | Prof.univ.dr.ing. Elvira Popescu | 2021 |
| **3** | Petcușin V. Felix-Alin | Prof.univ.dr.ing. Costin Bădică | 2020 |
| **4** | Andreiana N. Andrei-Daniel | Prof.univ.dr.ing. Costin Bădică | 2019 |
| **5** | Vultureanu-Albiși S. Alexandra | Prof.univ.dr.ing. Costin Bădică | 2019 |
| **6** | Ivănescu M.R. Constantin-Renato | Prof.univ.dr.ing. Mihai Mocanu | 2019 |
| **7** | Dobre V. Ștefania-Carmen* | Prof.univ.dr.ing. Elvira Popescu | 2018 |
| **8** | Badea C. Gabriel* | Prof.univ.dr.ing. Elvira Popescu | 2018 |
| **9** | Pîrvu Mihaela Ionela* | Prof.univ.dr.ing. Costin Bădică | 2018 |
| **10** | Hussein Aqeel Mohammed Ali Hussein* | Prof.univ.dr.ing. Costin Bădică | 2017 |
| **11** | Ciurezu Popa V.Didi-Liliana* | Prof.univ.dr.ing. Mihai Mocanu | 2017 |
| **12** | Murarețu I. Ionuț-Dorinel* | Prof.univ.dr.ing. Costin Bădică | 2017 |

*PhD students in the interruption period

**The evolution of the number of PhD students and the number of doctors in the last 5 years** whose theses have been confirmed by order of the Minister of National Education in the last 5 years, is summarized in the following table:

**Table 1.5** Evolution of numbers of PhD students and doctors confirmed in the field (2016-2021)

| ***Year*** | ***Total number of PhD students*** | ***Confirmed doctors*** |
|---|---|---|
| 2016 | 12[1] | 0 |
| 2017 | 14[1] | 0 |
| 2018 | 18[1] | 2 (Mancaș Cătălina Felicia and Faiq Sabbar Baji - Iraq) |
| 2019 | 19[1] | 2 (Popescu Paul-Ștefan and Becheru Alexandru) |
| 2020 | 17[1] | 1 (Constantinov Călin) |
| 2021 | 17 | 0 |

[1]by cumulating PhD students in different stages of the doctoral program, who appear as enrolled, including those in the period of interruption or extension

The list of doctoral graduates in the field of *Computers and Information Technology* (2016-2021) and the committees for the defense of theses are presented in Anexa B.3.2.1.

In the field of study *Computers and Information Technology*, **PhD students' research** is an important component of departmental research. At the level of the faculty and of the Department of Computers and Information Technology, we will make here a short **presentation of the research centers / laboratories**, which have been in the process of internal restructuring since 2021, according to Anexa 1.2_1. Calendar_infiintare_evaluare_centre_2021, as well as the **main scientific achievements.**

The Interdisciplinary Center for Research in Computers, Automation, and Robotics (CERCA), established by merging existing research centers at the level of faculty departments, whose organization is in accordance with the regulations presented in Anexa 1.2_2. Regulament evaluare infiintare centre cercetare was approved by the Council of the Faculty of Automation, Computers and Electronics in March 2021, has in its structure the **CATI Research Laboratory** (Computers and Information Technology), at the level of the homonymous department. The director of CERCA is professor Dr. Eng. Costin Bădică, and the director of the CATI laboratory is Prof. Dr. Eng. Elvira Popescu. The CATI team has 31 members, of which 3 are PhD supervisors and 8 are PhD students. Of the 23 experienced researchers in the team, 17 have over 1/5 CNATDCU professor teaching load (equivalent score) in the last 5 years (73.91%). The total score of the 23 researchers in the last 5 years is the equivalent of 15.10 CNATDCU professor teaching load. The main research groups/ research directions in focus are:

- *Data Analysis and High Performance Computing*. The research directions addresses the following topics (selection): Creation of predictive models and recommendation systems for e-Learning, medical applications; Applications that use natural language processing in e-Learning; Development of scientific computation kernels (linear algebra, image processing, spatial data structures); Processing large data sets with applications (eg K-means clustering

with applications in machine learning); Load balancing and computational steering with applications; Parallel performance evaluation; Heterogeneous CPU-GPU computing

- *Cloud Computing, Big Data and Cyber Security.* The research group aims to investigate the following directions: Storage and management of distributed data, Big Data Mining, risk management and quality assurance, spatio-temporal co-location, interdisciplinary collaboration (applications in the field of health and medical research; education)
- *Computer Graphics and Computer Vision.* Aims to investigate the following directions: Image and video processing, Image and video understanding, Data visualization, Visual databases, Computer graphics and animation, Game engineering, Virtual reality.
- *Intelligent Distributed Systems.* Smart computing includes artificial intelligence methods and techniques, machine learning and smart agents. Distributed systems are sets of interconnected computing components that run on computer networks and communicate and coordinate through message transfer. Current distributed systems include both cloud computing and edge and fog computing. The Group aims to conduct research on current distributed intelligent systems that integrate these concepts, determining new challenges to adapt and combine the results obtained, allowing the development of new applications: analysis and fusion of big data; the internet of things; federated machine learning; trusted decentralized distributed registers (blockchains).
- *Advanced Systems and Technologies for Education.* The proposed research direction is an interdisciplinary one, of great topicality and international relevance. The main research topics addressed include: smart learning environments, adaptation and personalization in e-learning, analysis of educational data (learning analytics), social and collaborative educational platforms.

The existing **research infrastructure** of the laboratory can provide logistical support for carrying out scientific research activities for teachers and for master's and PhD students of the Faculty. The infrastructure includes the Cloud system acquired through the POC project SMIS 124488, "Increasing the research capacity of the University of Craiova through investments in Cloud and Big Data infrastructures”. The Cloud infrastructure implemented by the project is based on a hyperconverged infrastructure (HCI). This infrastructure consists of:

- 9 hybrid processing-storage nodes: 2 processors per node, 26 cores per processor, 19 GB internal cache, 512 GB RAM, 4 x 10 Gigabit Ethernet, useful storage capacity per computing node: 20 TB, provided with hard SSDs, integrated in the hyper-convergent storage platform
- computing node with dedicated graphics processing: minimum two processors installed, 21 cores per processor, operating frequency 2.1 GHz, memory: 512 GB RAM, integrated graphics controller, 8 TB storage capacity, hard disks SSD, Hot-plug, Dedicated Graphics Processing Controller (GPU): 5100 CUDA cores
- Unified data storage and protection equipment: installed net storage capacity 300 TB total usable capacity in RAID6 configuration, provided from NLSAS disks
- VMWare Cloud Foundation Advanced

The Cloud resource center created within the project contributes to increasing the access of university researchers and PhD students to global information resources by interconnecting with national, European and international systems owned by important academic centers and research institutes. Thus, the University of Craiova can use specific Cloud tools for research and collaboration, which implicitly leads to an increase in research capacity and the degree of international cooperation.

The functional characteristics of the Cloud infrastructure are:

- IAAS – Infrastructure as a service. It provides automated and scalable work environments in the form of virtual machines that canpartially or fully use the available hardware resources;
- PAAS – Platform as a service.It automatically provides the necessary infrastructure and its management. The integratedmanagement allows the following:
    - provisioning of the operating system;
    - provisioning of the relational database management systems.
- SAAS – Software as a service. Allows running an application instance over the Internet using IAAS and PAAS resources without the need to install software on each terminal used.
- It is an integrated solution with high availability (no-single-point-offailure type);
- High availability architecture implemented for all the elements of the solution (processing nodes, Ethernet switches, switches/port management, infrastructure management hardware, infrastructure management server;
- High-performance connectivity at the solution level with speeds of at least 40 Gbps end-to-end (starting from top of rack switches and up to the network adapters installed in the system nodes);
- Latest generation Intel processors (Scalable Platform);
- Automated installation and configuration procedures for installing and expanding the solution;
- Allows the definition of configuration policies at the level of everyone solution component elements (including firmware and BIOS versions);
- It exposes open APIs to allow administrators to easily interact with it;
- The system allows the joint use of resources (IAAS, PAAS and SAAS), depending on specific needs or distributed over a period of time necessary for one or more research themes. The solution allows permanent update of SAAS resources as well as additional functionalities.

Global characteristics of the Cloud infrastructure: 7 computing nodes, 14 processors, 448 cores, 896 threads, 7 TB RAM memory, 590 TB SSD storage capacity.

Other resources include:- Myrinet cluster with 8 workstations

- IDS server running IDS CMS at http://ids.software.ucv.ro/ (currently decommissioned due to campus rehabilitation)
- Computational resources of the Research Infrastructure for Applied Sciences - INCESA, from the category "Intelligent Distributed Systems".

Regarding the **main scientific achievements**, they are materialized in a large number of **research projects**, **the most representative** being summarized in table 6, but also in the **offer addressed to the economic environment** by specialists in the field of *Computers and Information Technology* (table 7).

**Table 1.6**. Representative projects in the field "Computers and Information Technology"

| |
|---|
| *Project 1: “Novel Methods for the Development of Distributed Systems*”, Bilateral project with Systems Research Institute, Polish Academy of Sciences, 2019-2021 (transport budget for academic visits) (member of the research team: Costin Bădică) The project aims at analysis and designing new methods for developing distributed systems in the fields of *Smart Business Ecosystems and the Internet of Things.* |
| *Proiect 2: “E-DRIVE-TOUR: bEyonD the boRder of electrIc VEhicles: an advanced inTeractive cOURse”*, Erasmus+ Programme, Knowledge Alliances, 2020-2022, Project no: 612522-EPP-1-2019-1-EL-EPPKA2-KA, (Total grant: 724.583 EUR, UCV Budget: 73.612 EUR) (partner director: Costin Bădică). The project aims to develop an interactive interdisciplinary course in the field of electric vehicles. |
| *Project 3: "Platform for collaborative learning based on social media tools: aspects of data analysis (CoLSoM)",* CNCS grant - UEFISCDI type TE, code PN-II-RU-TE-2014-4-2604, duration: 2 years (Oct. 2015 - Sep. 2017), value: RON 548,550, grant director: Elvira Popescu. The project aimed to expand and improve the eMUSE educational platform, which was used successfully in the process of training students in Computer specialization. Also, in-depth studies were carried out on the collaborative activity of students in the online social learning environment, obtaining important contributions in the field of educational data analysis *(social learning analytics).* |
| *Project 4: "Development of the Tesys platform, http://idfeaa.ucv.ro/tesys/ (DPS)",* funding period: 2011–2020. Project manager: Cristian Mihaescu. The research / development activity has as main purposes the creation of recommendation systems, the evaluation of the usability of the interfaces, the realization of the exploratory data analysis studies, etc. by integrating existing or internally designed or developed machine learning algorithms. |
| *Project 5: "ICT COST Action CA18131: Statistical and machine learning techniques in human microbiome studies"*, EU-COST program (ML4Microbiome), funding period: 2019–2020 Romanian national / regional manager: Cristian Mihăescu. Coordinated research collaboration at European level in order to integrate machine learning methods in the medical field of microbiology (https://www.cost.eu/actions/CA18131/#tabs\|Name:management-committee) |
| *Project 6: "ICT COST Action IC1105: 3D Content Creation, Coding and Transmission over Future Media Networks,* EU-COST framework program (3D-ConTourNet) ", funding period: 2012–2016. Romanian national/regional head of the Romanian side: Mihai Mocanu. Coordinated research collaboration, at European level, in the creation of 3D multimedia content, coding, delivery and reception of services and applications in future network technologies. (https://www.cost.eu/actions/IC1105/#tabs\|Name:management-committee) |
| *Project 7: „Bridging the Gap: An AI-enabled versatile skill matching tool to assist the less privileged Program”: Erasmus+ Programme: KA220-YOU - Cooperation partnerships in youth Project Number: KA220-YOU-000028780 Coordonator: International Hellenic University, Greece Buget UCV: 53790 EUR (director partener: Costin Bădică)* |

**Table 1.7.** The offer addressed to the economic environment

| | |
|---|---|
| Research and development in the main research directions | - Use and integration of machine learning algorithms (classifiers, clustering, deep learning, NLP, image processing, etc.) in various application areas; Development and implementation of parallel / distributed algorithms; Performance evaluation at application and integrated system level<br>- Multi-agent modeling and simulation, mathematic optimization, heuristic algorithms, natural language analysis and processing, machine learning, formal representations (logic, semantics), software development for Web and mobile applications<br>- Managing large volumes of data, Big Data Mining, Cyber Security, Using cloud computing to better support the needs of managing large volumes of data and analyzing them in various fields such as medical and educational research |
| Research and development in related research directions | - Applications of intelligent and distributed computing methods in: transport and logistics, intelligent mobility, resource allocation, sentiment analysis, referral systems, crisis management, business process analysis, social network analysis, sustainability and environment.<br>- Innovative training platforms for employees (workplace learning) |
| Consultant | - Technologies and tools for designing and implementing data analysis flows; Technologies and tools for designing and implementing parallel / distributed applications<br>- Artificial intelligence methods and technologies, machine learning, heuristic algorithms, optimization, modeling and multi-agent simulation, computational statistics<br>- Services and consultancy in the field of workplace learning |
| Services | - Tesys e-Learning Platform: http://idfeaa.ucv.ro/tesys/ |
| Education | - Courses / workshops / tutorials in the field of machine learning algorithms (eg, classifiers, clustering, deep learning, NLP, image processing, etc.) and the tools / technologies used to design and implement data analysis flows<br>- Courses / workshops / tutorials in the field of parallel / distributed algorithms<br>- Courses and tutorials on artificial intelligence methods and technologies (knowledge representation, software platforms for machine learning, heuristic algorithms, mathematical optimization, uncertainty reasoning), multi-agent modeling and simulation, computational statistics, concurrent programming. |

## 1.3. The functioning of the internal quality assurance system at the doctoral level

The functioning of the quality assurance system in IOSUD - University of Craiova is achieved through specific procedures at the level of all structures involved (IOSUD, Doctoral Schools, doctoral fields), whose application is in accordance with the *Declaration of quality policy of the Rector of the University of Craiova Craiova* (Anexa 1.3_1). The objectives pursued by the University of Craiova in the field of quality management are included in the *Quality Assurance Code* (see https://www.ucv.ro/pdf/invatamant/management/cod.pdf or Anexa 1.3_2). The quality assurance system at the level of IOSUD and of the doctoral schools is integrated into the quality management structure of the university. The supreme authority in this system is represented by the *Senate of the University of Craiova*. The operative management of the University is ensured by the *Board of Directors*, composed of rector, vice-rectors, director of the council for doctoral studies, deans, the general administrative director and a student representative. The *Quality Management Department* (CMD) operates in the University. The CMD mission is established by the Charter of the University of Craiova, at Art. 162, and the objectives are specified in Art. 163 (Anexa 1.3_3. Carta_UCV_2020). Details on the specific quality assurance activities and practices of the DMC are presented Anexa 1.3_4. Regulamentul de organizare și functionare al DMC, Anexa 1.3_5. Planul strategic al DMC pentru perioada 2020-2024, Anexa 1.3_6. Planul operațional al DMC pentru anul 2021, as well as in Anexa 1.3_2. Codul de asigurare a calitatii.
*The Quality Assessment and Assurance Commission* (CEAC) functions under the DMC, constituted according to Art. 11 of Law 87/2006 for the approval of GEO no. 75/2005 regarding the quality assurance of education and according to Art. 165 of the University Charter. Its current formula (https://www.ucv.ro/invatamant/management/comisia/componenta.php ) was established by Decision 303C / 22.12.2020 of the Rector of UCv. The activity of DMC is monitored by the Commission for education, quality management and evaluation academic, subordinated to the Senate, which reports according to the instructions of ARACIS (external evaluator).
Quality assurance and evaluation policies and means of implementation in the field of education are developed and implemented by the DMC, and those in the field of scientific research, development and innovation by the *Scientific Research Council* of the University of Craiova (https://www.ucv.ro/cercetare/organizare/ccs/informatii_generale_CCS.php).
The internal quality assurance system at the level of doctoral university studies is in accordance with the one provided in the Regulation of the School of Doctoral Studies "Constantin Belea" (Anexa A.1.1.1_1) as well as with the *Procedure for internal evaluation of the activity of doctoral schools programs of IOSUD University of Craiova* (Anexa C.1.1.1_1).
The Director of the *School of Doctoral Studies "Constantin Belea"* annually prepares a self-assessment report of the SDCB, which is presented to the General Assembly of Doctoral Supervisors and subject to the approval of the CSD. This evaluates annually the efficiency of internal quality assurance procedures and structures, as well as their impact on activities in doctoral studies. The conclusions of the annual quality self-assessment report at the level of the *School of Doctoral Studies “Constantin Belea”* are analyzed within the General Assembly of

Doctoral Supervisors in order to identify problems and solutions for continuous quality improvement at the level of the SDCB.

The internal quality assurance and monitoring policy at the level of the *School of Doctoral Studies “Constantin Belea”* is transparent, being carried out according to this regulation which includes in its articles clear and quantifiable criteria to be met for the members of the *School of Doctoral Studies “Constantin Belea”*, PhD students and research results.

The general objectives of the internal quality assurance system at the level of doctoral studies result from the Regulation of the *School of Doctoral Studies "Constantin Belea"* and are structured on three basic directions aimed at:

- the quality and efficiency of the educational act within the field of doctoral studies,
- the quality and efficiency of the research activity of PhD students,
- the quality of the research results carried out by both the PhD supervisors and the PhD students.

*The quality of the educational act within the field of doctoral studies* is ensured by the periodic evaluation of the quality and structure of the doctoral study programs proposed in the curriculum displayed on the SDCB website (http://ace.ucv.ro/sdcb/2020_plan_invatamant_sdcb.pdf ), according to Art. 7 and Art 9 par. (1), (2), (6) and (7) of the Regulations of the *School of Doctoral Studies "Constantin Belea"*.

*The periodic evaluation of the PhDl supervisors from the School of Doctoral Studies "Constantin Belea"* is carried out according to the procedure and criteria provided in the Regulation of the “Constantin Belea” Doctoral School Art. (3) - (6).

*The quality of the research activity of the PhD students* is periodically evaluated according to the criteria from the Regulation of the *School of Doctoral Studies "Constantin Belea"*, Art. 4, Art. 7 par. (5), Article 8, Article 9 para. (1), (3), (4), (6).

*The quality of the research results carried out by PhD students* is periodically evaluated according to Art. 9 par. (1), (4), (5), (6), Art 10, Art 11.

The regulation of the *School of Doctoral Studies "Constantin Belea"* is closely related to the quality assurance system and management at the level of the University of Craiova, cf. Art. 1 par. (3) and (4). Personalities from IOSUD University of Craiova, scientific personalities from the country or abroad, PhD students can be invited to the meetings of the SDCB Council, without them having the right to vote. Transparency is ensured through the procedures and implemented systems and the access to specific information to the internal quality assurance system for beneficiaries internal and external (important details to be provided in section C of this Report) is facilitated.

## 2. Meeting criteria, standards and performance indicators

*This section provides the information necessary to assess the degree of compliance with the criteria, standards and performance indicators, provided in Annex no. 2 of the Order of the Minister of Education and Research no. 3651 of April 20, 2021, accompanied by supporting documents accessible in electronic format, as quality assurance measures in the field of doctoral studies "Computers and Information Technology".*

# A. INSTITUTIONAL CAPACITY

## A.1. Institutional, administrative, managerial structures and financial resources

### A.1.1. The mechanisms of efficient functioning at the level of IOSUD and the doctoral school

*The institution organizing doctoral studies*, IOSUD - University of Craiova, has implemented the efficient functioning mechanisms provided in the specific legislation on the organization of doctoral studies, this fact being reflected by the applicable Regulations in force, as we will detail below.

#### *A.1.1.1. The existence of specific regulations and their application at the level of IOSUD, respectively of the doctoral school*

**a) doctoral school regulations;**
The specific regulations at the level of IOSUD and the Doctoral School are annually or semi-annually discussed and updated. The regulation of the School of Doctoral Studies „Constantin Belea”, in the last form, in force at the date of the internal evaluation, was sent for consultation to all PhD supervisors, approved by the Council of SDCB vote on 23.04.2021 and in CSUD on 26.04.2021(see Anexa A.1.1.1-a.Aviz regulament si evaluare), and adopted by Decision number 4/2021 of the University Senate.The regulations are available at Anexa A.1.1.1_1 and also on the SDCB website. Anexa A.1.1.1_2. Regulamentul IOSUD pentru studii universitare de doctorat presents the last form of this institutional regulation, the one from 2021.

**b) the methodology for conducting the elections for the position of director of the Doctoral School Council (CSD), as well as the election by the students of the representative in the CSD and evidence of their development:** It is specified in the regulation in Anexa A.1.1.1_1. Regulament SDCB, art.2, paragraphs (2) - (4) and described in detail in Anexa A.1.1.1_3. Metodologia de desfăşurare a alegerilor la nivelul CSD. The minutes of the last elections at the CSD level of the School of Doctoral Studies “Constantin Belea”, held in 2020, are attached (Anexa A.1.1.1_4. PV alegeri CSD).

**c) methodologies for organizing and conducting doctoral studies (admission of PhD students, completion of doctoral studies);**
Admission to doctoral studies is regulated by the "Methodology for the organization and conduct of the competition for admission to undergraduate, master's and doctoral studies", updated and approved each year by vote by the Board of Directors and the University Senate. For the current

academic year (2021-2022), this regulation is attached, Anexa A.1.1.1_5. Regulament organizare si desfasurare admitere 2021-2022.
More information on admission to doctoral studies conducted in 2021 but also other elements of organizing doctoral studies are also available on the university website: https://www.ucv.ro/admitere/scoala_doctorala/index.php .
The organization and development of doctoral studies is regulated by several internal procedures, including the regulations of the doctoral school (art.5-9), as well as the completion of doctoral studies (art. 10-13).

**d) the existence of mechanisms for the recognition of the quality of PhD supervisor and for the equivalence of doctoral studies obtained in other states;**
These mechanisms for the recognition of the quality of PhD supervisor and for the equivalence of doctoral studies obtained in other states are included in two attached procedures:
Anexa A.1.1.1_6. Metodologie_de_recunoastere_a_calitatii_de_conducator_de_doctorat
Anexa A.1.1.1_7. Metodologie de echivalare a doctoratului obţinut în alte state

**e) functional management structures (Doctoral School Council), evidence regarding the regularity of convening meetings;**
The Council of the School of Doctoral Studies "Constantin Belea" consists of:

- PhD supervisors at the University of Craiova:

1. Prof. Univ. Dr. Ing. Costin Bădică – Director of the School of Doctoral Studies "Constantin Belea", PhD supervisor in Computers and Information Technology
2. Prof. Univ. Dr. Ing. Dorian Cojocaru, PhD supervisor in Mechatronics and Robotics
3. Prof. Univ. Dr. Ing. Daniela Danciu, PhD supervisor in Systems Engineering

- External members: Dr. Silviu Niculescu, Professor of Control Systems, L2S-CENTRALESUPELEC, France
E-mail: Silviu.Niculescu@l2s.centralesupelec.fr, Web: http://www.l2s.centralesupelec.fr/perso/silviu.niculescu
- Students:

1. Drd. Radu Lucian Constantinescu, PhD student in Systems Engineering

Evidence regarding the regularity of the convening of meetings is in Anexa A.1.1.1_8. Procese verbale ședințe CSD.

**f) doctoral studies contract;**
The doctoral studies contract exists in several variants, according to the annexes:
Anexa A.1.1.1. Contract studii doctorale taxa, Anexa A.1.1.1. Contract studii doctorale buget și Anexa A.1.1.1. Contract studii doctorale CPV

**g) internal procedures for analysis and approval of proposals on the subject of the training program based on advanced university studies:**
Anexa A.1.1.1_10. Proceduri interne de analiză și aprobare a propunerilor privind tematica programului de pregătire

***A.1.1.2 The regulation of the doctoral school includes criteria, procedures and mandatory standards for the aspects specified in art.17, par. (5) of the Code of doctoral studies, approved by Government Decision no. 681/2011, with subsequent amendments and completions.***

The regulations of the *School of Doctoral Studies "Constantin Belea"* establish mandatory criteria, procedures and standards regarding the following aspects:
a. acceptance of new doctoral supervisor members, as well as regulations regarding the way in which a PhD supervisor can be withdrawn as a member of the doctoral school: article 3 from Anexa A.1.1.1_1. Regulament SDCB.
b. decision-making mechanisms regarding the opportunity, structure and content of the training program based on advanced university studies: article 7 from Anexa A.1.1.1_1. Regulament SDCB.
c. the procedures for changing the doctoral supervisor of a certain PhD student and the procedures for mediating conflicts: article 12 from Anexa A.1.1.1_1. Regulament SDCB
d. the conditions under which the doctoral program may be interrupted: article 13 from Anexa A.1.1.1_1. Regulament SDCB.
e. ways to prevent fraud in scientific research, including plagiarism: article 11 from Anexa A.1.1.1_1. Regulament SDCB.
f. ensuring access to research resources: article 6 din Anexa A.1.1.1_1. Regulament SDCB.
g. attendance requirements for PhD students: article 5 (5) from Anexa A.1.1.1_1. Regulament SDCB.

**A.1.2. The necessary logistical resources at IOSUD level**

**IOSUD has the logistical resources necessary to fulfill the mission of doctoral studies.**

***A.1.2.1. Existence and effectiveness of an adequate informatic system for the record of PhD students and their academic background***

There is an electronic record of students and their academic background, through a computer program and a unique database for the three cycles of study, EvStud. The main characteristics based on which the record of PhD students is kept (completed starting with 2018) are: CNP, name and surname of PhD student, name and surname of doctoral supervisor (group), field, date of enrollment, period of PhD student (interruption, extension), etc., as well as other characteristics such as: PhD students' studies, schooling history, etc. Access is provided from the website: Link Evidenţa Studenţilor.

***A.1.2.2. Existence and use of a computer program and evidence of its use to verify the percentage of similarity in all doctoral theses***

There is a computer program that is used to verify the percentage of similarity in all doctoral theses, respectively the Sistemantiplagiat.ro program, recognized by CNATDCU. The connection

to the system is made by accessing *sistemantiplagiat.ro*, and the theses are compared with the databases available for the system and a Similarity Report is issued. The similarity ratio indicates the percentage of fragments identified, as well as their exact length and source. The similarity report is analyzed and interpreted by the PhD supervisor together with the PhD student. The user manual of the *Sistemantiplagiat* program is presented in Anexa A.1.2.2. Sistemantiplagiat.ro_Manual_Utilizator_RO.

**A.1.3. Optimal use of the necessary financial resources at IOSUD level. Additional funding**

**IOSUD ensures that financial resources are optimally used and that the revenues obtained from doctoral studies are supplemented by additional funding to that provided by the government.**

***A.1.3.1. The existence of at least one research or institutional development / human resources grant in implementation at the time of submitting the internal evaluation file, for the analyzed doctoral university field, or the existence, at the level of the field, of at least 2 research or institutional development / human resources grants obtained by doctoral supervisors in the field evaluated in the last 5 years. The grants address topics relevant to the field and, as a rule, are carried out with the involvement of PhD students.***

The 3 scientific supervisors working at the doctoral school, in the field of study *Computers and Information Technology*, have multiple collaborations, are permanently involved in fundamental and applied research activities and are part of the teams of grants obtained through competition and have managed to attract additional funding to support the activity of PhD students. The type of grants, according to the thematic area and the funding body, can be found in the CV of each PhD supervisor and in the CNATDCU standards verification sheets (presented as annexes to section A3 - Quality of human resources), but also in the summary presented in Anexa A.1.3.1. Centralizator granturi conducatori de doctorat in domeniul CTI.
In the period 2014-2015, a human resources development project was carried out, entitled *University Scholarships in Romania through European Support for PhD and Post-PhD students (SCHOLARSHIPS DOC-POSTDOC)*, no. POSDRU / 159 / 1.5 / S / 133255, coordinator Univ. from Craiova, partners Univ. "Lucian Blaga" from Sibiu, Univ. West Timisoara and Univ. from Bucharest, which benefited from PhD students from 2015-2020 in the field of CTI (Alexandru Becheru etc). Currently, another POCU project is underway, entitled *Entrepreneurial University - higher education and training system for the Romanian labor market by awarding scholarships for PhD students and postdoctoral researchers and implementing innovative entrepreneurship training programs*, POCU / 380 / 6/13/123990, 2019-2022 (see also the next section), in which other PhD students from the CTI field are beneficiaries (Pîrvu - Ilie Mihaela, Badea Gabriel).

***A.1.3.2. The proportion of PhD students existing at the time of the evaluation who benefit, for at least 6 months, from sources of funding other than government funding, through***

***scholarships granted by individuals or legal entities, or are financially supported by research or institutional development / human resources grants is of at least 20%.***

In the period 2016-2021, PhD students in the field of *Computers and Information Technology* were included in the research team of one of the grants presented in Anexa A.1.3.1 (the project, with the acronym PN-II-RU-TE-2014-4-2604, lasted 2 years and took place between oct. 2015 - Sep 2017) they were remunerated with amounts between 25,000 - 30,000 lei each (gross salary / h: 37 lei, number of hours / month variable - between 20 and 40, and number of months in variable project - between 20 and 23) PhD students Alexandru Becheru and Paul-Ștefan Popescu (with the thesis completed in 2019, MEC order in 2020) for periods longer than 6 months (almost 2 years each), and Gabriel Badea, current PhD student, for a period longer than 6 months, but as a master student ( he entered the doctorate on 1.10.2018). The PhD students existing at the time of the evaluation were also included in other projects or grants and benefited not only from funding but also from training, generally for periods of less than 6 months. These sources of funding were obtained based on existing collaborations within the *Faculty of Automation, Computers and Electronics*, as well as the *School of Doctoral Studies "Constantin Belea"*, but also at the individual level of PhD supervisors in the field of *Computers and Information Technology* with companies in the field or under research contracts.
In the period 2016-2021, PhD students in the field of CTI benefited from additional income compared to those obtained through government funding, usually obtained through project competition. PhD students who have competed and won QforIT private doctoral scholarships, according to Anexa A.1.3.2_2017. Raport_anual_burse_QforIT_2017, Anexa A.1.3.2_2018. Raport_anual_burse_QforIT_2018, Anexa A.1.3.2_2019._Raport_anual_burse_QforIT_2019 and Anexa A.1.3.2_2020. Raport_anual_burse_QforIT_2020 , lasting at least 6 months, are: Paul-Ștefan Popescu (12 months in 2017, 2018), Cătălina Mancaș (12 months in 2017, 2018), Sabin Simionescu (12 months in 2017, 2018), Alexandru Becheru (12 months in 2017, 2018), Gabriel Badea (7 Monday in 2019), Carmen Dobre (7 months in 2019), Ionuț Murarețu (7 months in 2019), Mihaela Pîrvu (7 months in 2019). Also, the POCU project, OS 6.13 - Support for PhD students and post-doctoral researchers has been implemented and is in progress: “Entrepreneurial University - higher education and training system for the Romanian labor market by awarding scholarships for PhD students and postdoctoral researchers and the implementation of innovative entrepreneurial training programs ”, POCU / 380/6/13/123990, period 2019-2022, amounting to 6,173,828.15 ron. Gabriel Badea and Mihaela Pîrvu, PhD students, have submitted applications in this project and have been selected for the time being. By consolidating the data presented: **3 of the former PhD students** and **6 of the 12 current PhD students** were supported to obtain additional income (for periods of more than 6 months), over those provided by government funding, representing a **percentage above 50%.**

****A.1.3.3. At least 10% of the total amounts related to doctoral grants obtained by the university through institutional contract and tuition fees collected from PhD students, from the form of paid education, are used to finance the training costs of PhD students***

***(participation in conferences , summer schools, courses, internships abroad, publication of specialized articles or other specific forms of dissemination, etc.).***

*Initiatives*: The University of Craiova has set up a special fund, in addition to the income related to doctoral grants, the Support Fund for Scientific Research Activity (SACS fund) which aims to support especially young researchers, including PhD students, to participate in international conferences and cover publication fees in internationally listed journals. The University of Craiova also has the experience of publishing a journal specifically designed to capitalize on the research activity of PhD students (*Journal of Young Researchers*, published since 2018: https://www.ucv.ro/cercetare/programe_de_cercetare/jyr.php. Series published so far are dedicated to other areas than those covered by the SDCB). *The School of Doctoral Studies "Constantin Belea"* together with the Faculty of Automation, Computers and Electronics supports the participation of PhD students in prestigious international conferences and summer schools in the field of study Computers and Information Technology by covering participation / publication fees, respectively travel and accommodation.

In the University of Craiova, the accounting statement of income and expenses is made at the level of doctoral schools, and not at the level of doctoral study fields (domains are not cost centers). Therefore, in the following we will try to make an *estimate* starting from the situation at the level of the School of Doctoral Studies "Constantin Belea".

Thus, in Anexa A.1.3.3_1. Venituri_Cheltuieli_SDCB_2016-2021 the revenues and expenditures for the period 2016-2021 are presented, with the breakdown of SDCB expenditures for the period 2016-2021. These documents show the situation of doctoral school income / expenses with the training of PhD students (participation in conferences, summer schools, courses and internships, publication of articles, etc.) for SDCB, presented in summary below in Table A.1.3.3.1. It should be mentioned that the SDCB funds were destined for the three fields of doctoral studies, so including the training of PhD students in the field of *Computers and IT*, by paying the expenses with participation in conferences, summer schools, etc.

**Tabelul A.1.3.3_1.** Training income / expenditure situation at SDCB level (2016-2021)

| Year | Income SDCB (ron) | SDCB expenses to train PhD students (ron) | Percent |
|---|---|---|---|
| 2016 | 252,120 | 0 | 0 |
| 2017 | 208,404 | 3,956 | 1.89% |
| 2018 | 103,972 | 0 | 0 |
| 2019 | 221,167 | 26,135 | 11.81% |
| 2020 | 208,504 | 2,543 | 1.21% |
| 2021 | 220,243 | 9,028 | 4.1% |
| Total | 1,214,410 | 41,662 | 3.43% |

The policy of the University of Craiova consists in the financial support of PhD students regarding vocational training from various sources: doctoral school funds, research fund, research projects. Thus, the university set up a special fund, in addition to income related to doctoral grants (described in Anexa A.1.3.3_2. Norme_utilizare_fond_SACS), called the Support Fund

for Scientifically Research Activity, broken down into centralized research and faculty research funds, which is intended to support young researchers, including PhD students, to participate in prestigious international conferences and to cover publication fees in international listed journals. During 2016-2021, numerous participation fees were paid, trips to international conferences and internships from the research fund of the Faculty of Automatics, Computers and Electronics, but also from research projects. Thus, in the last 5 years, most PhD students in the field of Computers and Information Technology have been supported by the payment of fees and travel expenses to prestigious conferences co-sponsored by IEEE. (*Int. Conf. on System Theory, Int. Conf. on System Theory, Control and Computing ICSTCC, Int. Carpathian Control Conf. ICCC* etc.).
In Anexa A.1.3.3_4.Tabel cheltuieli formare SDCB_2016-2021 is presented a situation of the expenses made by the University of Craiova for the training of PhD students from the incomes at the School of Doctoral Studies “Constantin Belea” and from the previously mentioned sources (research fund, research projects, etc.). It results that significant amounts were invested, which represent **157,337.24 lei** in the period 2016-2021 (which would mean a percentage of **12.96%** of SDCB revenues of **1,214,410 lei**). In order to estimate *the incomes of the field of study Computers and Information Technology in the last 5 years*, we will consider the situation of the Phd students enrolled in each academic year and a metric that we will call **year-student**. Thus, in the academic years from 2015-2021 we can register **203** year-student (97 from the budget and 106 from the fee) according to Anexa A.1.3.3_3._Doctoranzi_inrolati_SDCB_2016-2021. In the field of *Computers and Information Technology*, **84** year-student were registered (**38** for the budget and **46** for the fee). The result is a percentage of PhD students in the CTI field compared to the total SDCB of below 42%. Therefore, with a reasonable degree of robustness, it can be considered that the revenues of the field of *Computers and Information Technology* were not higher than half (50%) of the total revenues of SDCB, so it results revenues of maximum **607,205** lei in the period 2016-2021 (according to the total in Table A.1.3.3_1). From Anexa_A.1.3.3_4 it results that in 2016-2021, **100,642** ron were spent from additional funds (research fund, research projects), see also Table A.1.3.3.2. This amount, although not spent directly from the doctoral school funds, represents a percentage of **16.57%** of previously estimated CTI revenues. We mention that the expenses incurred for the field from the SDCB funds, which are included in the amounts presented in Table A1.3.3_1, were not considered here.

**Tabelul A.1.3.3_2.** Estimation of training expenses for PhD students in the field of CTI (additional funds: research fund, research projects), 2016-2020

| Year | Proportional income (50%) of the CTI domain in SDCB (lei) | Additional expenses for PhD students (lei) | Percent |
|---|---|---|---|
| 2016 | 126,060 | 12,396 | 9.83% |
| 2017 | 104,202 | 15,195 | 14.58% |
| 2018 | 51,986 | 8,455 | 16.26% |
| 2019 | 110,583 | 33,221 | 30.04% |
| 2020 | 104,252 | 26,135 | 25.07% |
| 2021 | 110,122 | 5,240 | 4.76 |
| Total | **607,205** | **100,642** | **16.57%** |

## A.2. Research infrastructure

### A.2.1. Research infrastructure at IOSUD level for the evaluated field

**IOSUD has a modern research infrastructure, which supports the development of activities specific to doctoral studies**

***A.2.1.1. The spaces and material endowment of the doctoral school allow the realization of research activities, in the evaluated field, in accordance with the mission and objectives assumed (computers, specific software, equipment, laboratory equipment, library, access to international databases, etc.). The research infrastructure and the offer of research services are presented publicly through a profile platform. The research infrastructure described above, acquired and developed in the last 5 years, will be highlighted separately.***

The spaces and material endowment of the School of Doctoral Studies "Constantin Belea" in the field of ***Computers and Information Technology*** include: research laboratories, computing facilities, documentation facilities - library, access to international databases. These are set out in detail in the annexes corresponding to this section, as follows:

***A.2.1.1-a. The spaces and material endowment of IOSUD / "Constantin Belea" Doctoral School in the field of Computers and Information Technology***

1. Educational and research spaces of the *Faculty of Automation, Computers and Electronics* (Anexa A.2.1.1-a_1. Spatii de invatamant si cercetare FACE)
2. The spaces and material endowment of the *School of Doctoral Studies "Constantin Belea"* the field of study *Computers and Information Technology* (Anexa A.2.1.1-a_2.Spaţiile şi dotarea materială a SDCB-CTI)

***A.2.1.1-b. Documentation base***

1. Book titles in the field of *Computers and Information Technology* (Anexa A.2.1.1-b_1.Titluri de carte in domeniul CTI)
2. Scientific research book fund (Anexa A.2.1.1-b_2.Fond de carte cercetare)
3. Periodicals in the field of study *Computers and Information Technology* (Anexa A.2.1.1-b_3.Publicatii periodice in domeniul CTI)
4. Specialized collections (Anexa A.2.1.1-b_4.Colectii de specialitate)
5. International scientific databases (Anexa A.2.1.1-b_5.Baze de date stiintifice internationale)

The Constantin Belea doctoral school benefits for the advanced training and research activities in the field of CTI from the infrastructure of the homonymous department: through this it has in shared regime an infrastructure consisting of lecture and seminar rooms (Anexa A.2.1.1-a_1), having a modern endowment for the study of the disciplines within the field. The research activities in the evaluated field are carried out in accordance with the mission and assumed objectives by using the material endowment of the SDCB present in Anexa A.2.1.1-a_2.Spaţiile şi dotarea materială a SDCB-CTI, but also the documentation base which includes:

1. Periodicals in the field of *Computers and Information Technology* (Anexa A.2.1.1-b_3.Publicatii periodice in domeniul CTI)
2. Specialized collections (Anexa A.2.1.1-b_4.Colectii de specialitate)

PhD students and members of the Doctoral School in the field of Computers and Information Technology carry out their research activity mainly in the following laboratories that provide logistical support for carrying out scientific (but also didactic) research activities:

1. ***MIRINET Laboratory:*** provides support for conducting research in the field, being equipped to meet technological requirements**.** The laboratory has specialized hardware and software equipment: 8 dual core 1G ram computers interconnected through a fiber optic network with a speed of 2GB / s and software related to the development of distributed applications.

***2.*** 2. ***Cloud Center UCv***: provides cloud computing services for designing, testing, deploying and managing applications and services through a global network of data centers, used by numerous academic and research organizations in Romania and around the world. Thus, the PhD students and researchers within UCv will be able to use specific Cloud tools for research and collaboration, which will increase the research capacity and the degree of international cooperation

**INCESA (Infrastructură de Cercetare pentru Științe Aplicate)**

PhD students and members of the Doctoral School can carry out scientific research activities in INCESA laboratories (Infrastructură de Cercetare pentru Științe Aplicate), a research infrastructure of the University of Craiova that promotes excellence in the field of applied sciences. *The INCESA infrastructure and the offer of research services are publicly presented on the ERRIS platform*: http://erris.gov.ro/Research-Infrastructure-in-A . INCESA laboratories are equipped with modern equipment and software offering conditions for high-level research and experiments. The infrastructure was developed through the SMIS-13845 project (budget 12,400,000 Euros), carried out in 2010-2016. Research centers such as the Center for Research in Computer Science (CCDSC) are made available to PhD students for research activities.

The University of Craiova has a Library that manages over 1,000,000 volumes, of which 28,000 volumes are special collections, and over 3,000 periodical titles. The library works with over 85 inter-library exchange partners abroad and 45 in the country. The Library's website offers possibilities to consult the online database of the collection http://biblio.central.ucv.ro/index.html and many other useful information about the program, locations, interactive communication with the library services and links to online databases provided within the university campus.

The library of the Faculty of Automatics, Computers and Electronics offers PhD students and professors in the field of Computers and Information Technology a book deposit and home loan center with a book fund of 62,758 volumes, reading room with free access to the shelf with 30 seats and a fund of 5,854 volumes. There is also a periodical depository and reading room with a serial publication fund of 9,978 volumes and a reading room with 20 seats. These rooms are also equipped with 6 computers and 2 multifunctionals.

At the end of 2021, the UCv Library's online catalog contained over 350,000 bibliographic records. The activities of documentation and electronic communication of information to users, in pandemic conditions, totaled in 2020 a number of 9,111 virtual transactions, and there were

over 400,000 virtual visits to the Library's resources.

The University of Craiova has online access to over 10 fulltext, bibliographic, bibliometric or scientometric scientific databases (Anexa A.2.1.1-b.Baze de date stiintifice internationale), with updated titles and periodicals (after the financial contribution, within the Association of Universities, Research-Development Institutes and Central University Libraries of Romania „ANELIS PLUS”) http://biblio.central.ucv.ro/bib_web/ro/Anelis_Plus. php, which also contain components specific to the field of Computers and Information Technology:

1. *SCIENCE DIRECT FREEDOM COLLECTION*
2. *SPRINGERLINK JOURNALS*
3. *TAYLOR AND FRANCIS JOURNALS (arhivă)*
4. *CAMBRIDGE JOURNALS*
5. *AMERICAN INSTITUTE OF PHYSICS – AIP*
6. *WEB OF KNOWLEDGE (WoS, Journal Citation Reports, Derwent Innovations Index)*
7. *SCOPUS*
8. *IEEE/IET Electronic Library (IEL).*

At the same time, free access to the online fulltext scientific database https://arxiv.org/ provides an excellent source of documentation in the field of Computers and Information Technology.

The own book fund from both Romanian and foreign specialized literature fully covers the disciplines from the curriculum, having in a significant weight the book titles or specialized courses for the doctoral studies field Computers and Information Technology subject to evaluation according to Anexa A.2.1.1-b_1.Titluri de carte in domeniul CTI and Anexa A.2.1.1-b_2.Fond de carte cercetare.

The infrastructure related to the Library is presented publicly and available through the online catalog, TINREAD, through which users can have access to information related to the location, availability of copies and identification code, but also to fulltext publications. (http://catalog.ucv.ro/opac ). Also, the offer of research publications is publicly presented through the Anelis Mobil platform (http://www.anelisplus.ro/?page_id=64), from the statistics provided by the Anelis Plus Association (January 2020 - December 2020) resulting in over 365,183 accesses (in CPU) of IP-based and mobile access users.

## A.3 The quality of human resources

### A.3.1. Existence of qualified personnel in the field of study

**At the level of each field of study there are qualified staff with the necessary experience to carry out the doctoral studies program.**

***A.3.1.1. Within the doctoral field os study, at least three PhD supervisors (quality obtained according to the law) work and at least 50% of them (but not less than three) meet the minimum CNATDCU standards in force at the time of the evaluation, necessary and mandatory for obtaining the habilitation certificate.***

The minimum standards of the CNATDCU Commission 15 in the field of study are the following:

- total score: **850**; on criteria: A1 (didactic and professional activity) = **100**; A2 (research activity) = **600**; A3 (recognition and impact of the activity) = **150**;
- minimum conditions by subcategories: books: 2 / art. ISI: 15 (of which 3 Q1-Q2, equivalent A +) / project manager: 2 / no. ISI citations: 25 / Cumulative ISI FI: 10.

In the field of *Computers and Information Technology*, there are 3 PhD supervisors. Of these, 2 obtained right for doctoral supervision before the appearance of the Education Law 1/2011, and the third has the right for doctoral supervision. The current list of PhD supervisors working in the field of *Computers and Information Technology* is as follows:

| **Nr. Crt.** | **Surname** | **Name** | **Affiliation** | **Order and title conferment date** |
|---|---|---|---|---|
| 1. | Costin | Bădică | Faculty of Automation, Computers and Electronics, University of Craiova | 1805 / 20.08.2007 |
| 2. | Mihai Lucian | Mocanu | Faculty of Automation, Computers and Electronics, University of Craiova | 1805 / 20.08.2007 |
| 3. | Elvira | Popescu | Faculty of Automation, Computers and Electronics, University of Craiova | 3379 / 22.03.2018 |

The degree of fulfillment by them of the CNATDCU minimum standards, based on the verification sheets submitted and presented in Anexa A.3.1.1_1, for Costin Bădică, Mihai Mocanu and respectively Elvira Popescu, is presented in the following table.

**Table A.3.1.1.** The degree of fulfillment of the minimum standards by the doctoral supervisors in the field of *Computers and Information Technology*

| **Nr. crt.** | **Name and Surname** | **Achieved score according to minimum required and mandatory standards for obtaining the habilitation CNATDCU certificate Commission: 15. Computers, Technology Information and Systems Engineering** [OMENCS nr. 6129 / 20.12.2016] http://www.cnatdcu-c15.org/ | **Finding on the fulfillment of the indicator** |
|---|---|---|---|
| 1. | Costin Bădică | Total score: **4014.05**<br>Criteria and conditions: A1+A2+A3: **177.75** + **2107.60** + **1628.69**; **4 / 111 (5+4A) / 6 / 340 / 46.09** | Accomplished |
| 2. | Mihai Mocanu | Total score: **1788.7**<br>Criteria and conditions: A1+A2+A3: **237.48**+ **1109.76**+ **441.46**; **3+14/ 48 (1Q1+2Q2+ +7Q3) / 2 / 55 / 23.47** | Accomplished |

| | | | |
|---|---|---|---|
| 3. | Elvira Popescu | Total score: **5174.72**<br>Criteria and conditions: A1+A2+A3:<br>**170.83** + **1451.16** + **3552.73**; **2 / 111 (5Q1+3Q2)/ 2 / 426/ 32.38** | Accomplished |

The CVs of the doctoral supervisors are presented in Anexa_A.3.1.1_2. It also includes the CV of the holder of the discipline *Ethics and academic integrity*, Prof. Dr. Edmond Gabriel Olteanu, PhD supervisor in the field of Law.

1. CV Costin Bădică (Anexa A.3.1.1_2. CV_Costin_Badica)
2. CV Mihai Mocanu (Anexa A.3.1.1_2. CV_Mihai_Mocanu)
3. CV Elvira Popescu (Anexa A.3.1.1_2. CV_Elvira Popescu)
4. CV Gabriel Olteanu, holder of the discipline Ethics and academic integrity (Anexa A.3.1.1_2.CV_Gabriel_Olteanu)

***A.3.1.2. At least 50% of the doctoral supervisors in the evaluated doctoral field are tenures within IOSUD, employed with an employment contract for an indefinite period.***

All the 3 PhD supervisors have the didactic degree of university professor and are tenured at the Faculty of Automation, Computers and Electronics, University of Craiova. The certificate from human resources for the PhD supervisors in the field of *Computers and Information Technology* who are holders within IOSUD University of Craiova is presented (Anexa A.3.1.2. Membri SDCB titulari UCv). This quality is also certified by Anexa 1.1_4.Conducatori de doctorat afiliati IOSUD, where the three PhD supervisors in the field are listed at positions 77-79.

***A.3.1.3. The disciplines in the training program based on advanced university studies related to the field are taught by teachers or researchers who have the quality of doctoral / qualified supervisor, professor / CS I or associate professor / CS II with proven expertise in the field of taught subjects or other specialists in field that meet the standards established by the institution for the teaching and research functions mentioned above, in accordance with the law***

According to the attached documents, for the current academic year, the subjects in the training program and their holders are as follows (see also the Curriculum for the academic year 2020-2021 - Anexa_A.3.1.3_1, as well as the subject sheets – Anexa_A.3.1.3_2):

1. *Algorithms Analysis and Design*: discipline holder prof.univ.dr. ing. Costin Bădică
2. *Computer Networks*: discipline holder prof.univ.dr. ing. Costin Bădică
3. *Artificial Intelligence* discipline holder prof.univ.dr. ing. Costin Bădică
4. *Multi-Agent Systems*: discipline holder prof.univ.dr. ing. Costin Bădică
5. *Data Modeling and Analysis*: discipline holder prof.univ.dr. ing. Mihai Mocanu
6. *Parallel Computing*: discipline holder prof.univ.dr. ing. Mihai Mocanu
7. *Machine Learning*: discipline holder conf.univ.dr. ing. Cristian Mihăescu
8. *Web Systems and Technologies*: discipline holder prof.univ.dr. ing. Elvira Popescu
9. *Human Computer Interaction*: discipline holder prof.univ.dr. ing. Elvira Popescu

Each of these disciplines has 6 credits allocated, a number of 4 disciplines being chosen individually after enrollment for each PhD student. The procedure for the analysis and approval of proposals on the subject of the advanced training program at the level of the SDCB is

presented in Anexa A.3.1.3_3.Procedura de aprobare a programului de pregatire avansata
The following disciplines from the common core are added to these, each with 3 credits allocated:

1. *Methodology of Scientific Research*: discipline holder prof.univ.dr. ing. Costin Bădică
2. *Ethics and Academic Integrity*: discipline holder prof.univ.dr. Edmond Gabriel Olteanu

The curriculum of the School of Doctoral Studies "Constantin Belea" for the year 2020-2021 and all other plans for the reference period are in the Anexa A.3.1.3_1. Planuri de invatamant SDCB 2016-2021. The positions of the "Constantin Belea" Doctoral School 2018-2019 are also presented (Anexa A.3.1.3_4).

***A.3.1.4. The share of doctoral supervisors who coordinate more than 8 PhD students at the same time, but not more than 12, during their doctoral studies, does not exceed 20%.***

According to the summary **tables 1.1.b and 1.4.b** in section 1 of this report, for the CTI field the number of PhD students currently on internship is 11 (plus another 2 in interruption).
- Prof. univ. dr. ing. Costin Bădică – 7 PhD students
- Prof. univ. dr. ing. Mihai Mocanu – 2 PhD students
- Prof. univ. dr. ing. Elvira Popescu – 2 PhD students

It results that none of the 3 doctoral supervisors coordinates more than 8 PhD students at the same time, during their doctoral studies (3 or 4 years, depending on the field, to which can be added the legally granted extension periods). As shown in **Table 1.1.b**, this condition was verified throughout the reference period.

**A.3.2 The scientific activity of PhD supervisors in the evaluated field of study**

**The PhD supervisors within the Doctoral School carry out an internationally visible scientific activity.**

***A.3.2.1. At least 50% of the doctoral supervisors in the field of study subject to evaluation present at least 5 indexed publications Web of Science or ERIH in journals with impact factor or other relevant achievements for the respective field, in which there are international contributions that reveal a progress in scientific research-development innovation for the evaluated field of study. The mentioned doctoral supervisors have international visibility in the last 5 years, consisting in: membership in the scientific committees of the international publications and conferences; membership in the boards of international professional associations; guest at conferences or groups experts conducted abroad or a member of commissions for the defense of doctoral theses at foreign universities or in co-supervision with a foreign university.***

All 3 PhD supervisors in the field of *Computers and Information Technology* have more than 5 papers indexed Web of Science (Clarivate Analytics) in journals with impact factor, which include contributions that reveal progress in scientific research-development for that field, of

international level, cited by other researchers in their papers. The cumulative Hirsch index is 26 (the average 8.67) - according to https://apps.webofknowledge.com (Web of Science -WOS / Clarivate Analytics): Bădică Costin 11, Mocanu Mihai 5, Popescu Elvira 10. Number of ISI papers in the last 5 years, according to the same portal, is 119: Costin Bădică 66, Mocanu Mihai 20, Popescu Elvira 33.
Other data regarding the international visibility in the last 5 years, according to the expressed requirements, or for the entire activity, are the following:

- 267 publications included in Web of Science (the entire activity): Bădică Costin 162, Mocanu Mihai 39, Popescu Elvira 66
- 928 citations in WOS (all activity): Bădică Costin 505, Mocanu Mihai 45, Popescu Elvira 378
- 21 positions in the scientific committees of some international journals (last 5 years), as editor of journals included in WOS or in SCOPU, guest editor or reviewer: Bădică Costin 5, Mocanu Mihai 4, Popescu Elvira 12
- editor, organizer / member of scientific / program committees of international conferences / session chair (last 5 years): Bădică Costin 15 / over 40 / over 40, Mocanu Mihai 3/7 / over 20, Popescu Elvira 25 / over 140/35
- member of the boards of international professional associations / guest at conferences or groups of experts held abroad (last 5 years): Bădică Costin 1/9, Mocanu Mihai 0/2, Popescu Elvira ¾
- 12 theses coordinated with the confirmed title, of which 8 in English (for the whole activity) / 3 doctorates in co-supervision or positions of members in doctoral committees abroad (last 5 years): Bădică Costin 5/4/1, Mocanu Mihai 7 / 4/0, Popescu Elvira 0/0/2

Overall, we can appreciate that the international visibility of the scientific activity of doctoral supervisors in the field under evaluation is very good, even exceptional for two of them (Bădică Costin and Popescu Elvira).
Some of the indexed scientific papers, but also other details on the international visibility of the scientific activity of doctoral supervisors in the field and / or justifications of the synthesis data presented here can be found in the annexes to this section, as follows:

1. List of at least 5 ISI listed papers for Costin Bădică (Anexa A.3.2.1_1. Costin Bădică)
2. List of at least 5 ISI listed papers for Mihai Mocanu (Anexa A.3.2.1_1. Mihai Mocanu)
3. List of at least 5 ISI listed papers for Elvira Popescu (Anexa A.3.2.1_Elvira Popescu), respectiv:

1. International visibility for Costin Bădică (Anexa A.3.2.1_2. Costin Bădică)
2. International visibility for Mihai Mocanu (Anexa A.3.2.1_2. Mihai Mocanu)
3. International visibility for Elvira Popescu (Anexa A.3.2.1_2. Elvira Popescu)

Details on this last point can also be found in Anexa_A.3.1.1_2, where the CVs of the doctoral supervisors are presented, which also contain other elements of international visibility.

***A.3.2.2. At least 50% of the doctoral supervisors assigned to a field of doctoral studies continue to be scientifically active, obtaining at least 25% of the score required by the minimum CNATDCU standards in force at the date of evaluation, necessary and mandatory to obtain the certificate of qualification, based on scientific results from the last 5 years.***

All three PhD supervisors in the field of *Computers and Information Technology* meet this

requirement, achieving in the last 5 years (2016-2020) over 25% of the score afferent to the Minimum Standards for habilitation (850 p. for Commission 15 CNATDCU):

• Prof. univ. dr. ing. Costin Bădică : 169%
• Prof. univ. dr. ing. Mihai Mocanu : 52.34%
• Prof. univ. dr. ing. Elvira Popescu : 295.14%

The way in which the percentage of the score required by the minimum CNATDCU standards in force at the date of evaluation was calculated results from the following table.

**Tabelul A.3.2.** Degree of achievement of minimum standards by PhD supervisors in the field of study *Computers and Information Technology* (last 5 years)

| **Nr. crt.** | **Name and Surname** | **Score achieved according to minimum standards required and mandatory for obtaining the habilitation certificate CNATDCU Commission: 15. Computers, Technology Information and Systems Engineering** [OMENCS nr. 6129 / 20.12.2016] http://www.cnatdcu-c15.org/ | **Findings on achieving indicator** (over 25% of the score of 850 in the last 5 years) |
|---|---|---|---|
| 1. | Costin Bădică | Total score: **1439.57**<br>Criteria A1+A2+A3: 154 + 716.85+568.72 | 169%<br>Achieved |
| 2. | Mihai Mocanu | Total score: **444.92**<br>Criteria A1+A2+A3: 12.5 + 271.26 + 161.66 | 52.34%<br>Achieved |
| 3. | Elvira Popescu | Total score: **2508.74**<br>Criteria A1+A2+A3: 50 + 520.65 + 1938.09 | 295%<br>Achieved |

The data in the table result from the verification sheets for the last 5 years submitted by the doctoral supervisors, included in **Anexa_A.3.2.2.**

1. National minimum standards verification sheet for the last 5 years - Costin Bădică (Anexa A.3.2.2.1)
2. National minimum standards verification sheet for the last 5 years - Mihai Mocanu (Anexa A.3.2.2.2.)
3. National minimum standards verification sheet for the last 5 years - Elvira Popescu (Anexa A.3.2.2.3.)

# B. EDUCATIONAL EFFECTIVENESS

## B.1. The number, quality and diversity of the candidates who took part in the admission exam

### B.1.1. Ability to attract candidates

**The institution organizing doctoral studies has the capacity to attract candidates from outside the higher education institution or in greater numbers than the number of places financed from the state budget.**

***B.1.1.1. The ratio between the number of master's degree graduates of other higher education institutions in the country or abroad who have registered for the competition for admission to doctoral studies in the last 5 years and the number of places financed from the state budget put up for competition within the field of doctoral studies is at least 0.2, or the ratio between the number of candidates in the last five years and the number of places financed from the state budget put up for competition in the field of doctoral studies is at least 1.2***

In the period 2015-2020, 4 master's degree graduates from other higher education institutions entered the admission competition. During this period, 9 places in the budget according to the Anexa B.1.1.1 were allocated for admission to the Doctoral School in the field of Computers and Information Technology.
Thus, the ratio between the number of master's degree graduates of other higher education institutions in the country or abroad who have entered the competition for admission to doctoral field of study in the last 5 years and the number of places financed from the state budget for the doctoral field of study is 4/9 = **0.44**> 0.2.
At the admission colloquium for the occupation of the 9 budgeted places allocated to the field of Computers and Information Technology, there were 19 candidates according to Anexa B.1.1.1.
The second required ratio results: 19/9 = **2.1**> 1.2.
Anexa B.1.1.1 contains, in addition to the list of PhD students enrolled in the field of *Computers and Information Technology* the graduates and the situation of budgeted places put up for competition and the number of candidates who competed in these places, in the field of *Computers and Information Technology* in 2016-2021.

### B.1.2. Performance of candidates admitted to doctoral field of study

**Candidates admitted to doctoral field of study demonstrate academic, research and professional performance.**

***B.1.2.1. Admission to doctoral study programs is based on selection criteria that include: the academic, research and professional performance of the candidates, their interest in scientific or artistic / sports research, field publications and a research topic proposal. An interview with the applicant is a mandatory part of the admission procedure.***

The criteria based on which admission to the doctoral study program in the field of study

*Computers and Information Technology* si done are presented in Anexa B.1.2.1. Art. 2, states "The competition test consists of an interview conducted following an oral presentation of the candidate. This presentation will highlight your own scientific research concerns, the bibliography studied and a direction in which the doctorate thesis will be written. The presentation is followed by a clarifying discussion (interview) with the members of the committee admittance."

***B.1.2.2. The expulsion rate of PhD students, including after dropping out of school, at 3 years after admission, does not exceed 30%.***

According to the program ***Evidenţa Studenţilor*** and centralized data transmitted by IOSUD (based on the same program), the number of students enrolled at the end of 2016-2021 is 17, the number of graduates (doctors) between 2015-2020 is 5 (centralized data in **table 1.5** from section 1.1) and the number of students expelled during 2015-2020 is 7.
The result is an expulsion rate of PhD students, including after dropping out of school,at 3 years after admission, of 7 / (17 + 5 + 7) = **24.13%.**

## B.2. Content of doctoral study programs

### B.2.1. Training program based on advanced university studies

**The training program based on advanced university studies is adequate to improve the research skills of PhD students and to strengthen ethical behavior in science.**

***B.2.1.1. The training program based on advanced university studies includes at least three disciplines relevant for the training of students in scientific research, of which at least one discipline is intended for the in-depth study of research methodology and / or statistical data processing.***

The curriculum related to *Computers and Information Technology* contains 10 subjects to which are added two disciplines: one dedicated to the in-depth study of the *Scientific Research Methodology* covering the topic of statistical data processing, the second to deepen the notions of *Ethics and academic integrity*. PhD supervisors, in accordance with the topics of doctoral theses, choose for each PhD student 6 disciplines out of the 12 for their individualized training. The didactic activities related to the university curriculum approved by the Doctoral School Council are carried out for a period of 14 weeks, according to the structure of the year approved by the University Senate.

1. *Methodology of Scientific Research* discipline sheet is presented in Anexa A.3.1.3_2.
2. The list of in-depth study disciplines in the field of *Computers and Information Technology* is presented in the section A.3.1.3 of this report.
3. The archive with discipline sheets of the subjects from the curriculum in the field of study *Computers and Information Technology* is presented in Anexa A.3.1.3_2.

***B.2.1.2. There is at least one discipline dedicated to ethics in scientific research and intellectual propery or well-defined thematic on these topics within a discipline taught in the training program.***

The curriculum of the "Constantin Belea" Doctoral School contains a common discipline

dedicated to the in-depth study of ethics and academic integrity, whose main objective is to help students understand the importance of ethical behavior in research (action in accordance with the public interest, respect for intellectual property , observance of professional standards at the highest possible level, independence of professional decisions, etc.) and norms of academic conduct in relations with teachers and researchers (peer support, permanent self-improvement, etc.). The discipline sheet is presented in Anexa A.3.1.3_2.

***B.2.1.3 IOSUD has created mechanisms to ensure that the training program based on advanced university studies, related to the evaluated field, aims at "learning outcomes", specifying the competencies, skills and attitudes that PhD students should acquire after completing each discipline or through the Research activities.***

IOSUD ensures the acquisition of competencies and skills by PhD students by creating well-defined mechanisms specified in the content of the Anexa A.3.1.3_2. (discipline sheets). At the same time, students are advised by the advisory committees on how to approach the research activity.
IOSUD - The University of Craiova has created the mechanisms that allow the training program based on advanced university studies in the field *of Computers and Information Technology* to ensure the acquisition of competencies, skills and aptitudes that PhD students must possess at the end of studies. These are specified in the content of the programs (discipline sheets) that are in Anexa A.3.1.3_2. The content of the curricula is analyzed in the Doctoral School Council of SDCB.
Also, in Anexa_A.1.1.1_1, *Regulation on the organization and functioning of doctoral and postdoctoral study programs at IOSUD-UCv* there are mechanisms specified through which the training program based on advanced studies aims at learning outcomes (Chapters III and V ).
Thus, IOSUD ensures that students develop skills and techniques indispensable in scientific research, "including the synthesis and assessment skills needed to solve critical research and / or innovation problems and to expand and redefine existing professional knowledge or practices." (Anexa nr. 1: National qualifications framework at H.G. 132/2018, M.O. 273 from 28.03.2018).
The essential knowledge and skills that must result from advanced training and research programs are also analyzed in meetings with strategic partners of the faculty (NetRom, Caphyon, Continental Sibiu, Hella Craiova, CS Romania, QFort, etc.), some of the employees of of these companies following doctoral training programs in the field of study *Computers and Information Technology.*
Also, through individualized discussions with the advisory committees (see also the next section), or on the occasion of the presentation of the research reports, the PhD students are advised with on how to approach research activities, autonomously and responsibly. Finally, the learning outcomes are found in doctoral theses.

***B.2.1.4. Throughout the doctoral training period, PhD students in the field benefit from the advice / guidance of functional advisory committee, an aspect reflected by guidance and views expressed in writing or regular meetings.***

The PhD students admitted to doctoral studies benefit, starting with the 2014-2015 academic year, from guidance teams formed by the PhD supervisor and 3 specialist members, teachers or researchers in the field of *Computers and Information Technology*. The advisory committee works throughout the internship to prepare the doctoral thesis, provides specialized advice to the PhD student, participates in the evaluation of research during the internship and at research

reports presentation at the end of each year. The advisory committee studies and reports on the quality of the doctoral thesis and admits or rejects the final defense of the doctoral thesis before the doctoral committee.
All PhD students in the field of study *Computers and Information Technology* have set up advisory teams and appreciate the collaboration with the members of these teams. Regular meetings take place between the PhD student and the advisory committee, based on a program established by the supervisor, the PhD student and the members of the committee. At the same time, the PhD student has a sustained activity within the research group assigned to the doctoral supervisor. Throughout the doctoral training period, PhD students in *Computer and Information Technology* benefit from the advice of functional advisory committees, reflected in written advisory and feedback or regular meetings, complementary to those offered by the PhD supervisor. In Anexa B.2.1.4 a summary table is presented with the advisory committee of the PhD students in the internship.
In addition to being members of research project support committees, members of the advisory committee have participated in other activities with PhD students (for example, as members of research project teams), and some members of the advisory committees are co -authors of published or communicated scientific papers, together with PhD students, as it results from Anexa B.2.1.4_2.Fișa activităților doctorale – doctoranzi în stagiu

***B.2.1.5. For a doctoral field of studies, the ratio between the number of PhD students and the total number of teachers / researchers providing guidance should not exceed 3: 1.***

In the field of Computers and Information Technology, 17 PhD students are currently enrolled according to **table 1.5** in section 1.2, number calculated by cumulating PhD students in different stages of the doctoral program, including those in the interruption or extension period. The number of those currently undergoing either the training program based on advanced university studies or the scientific research program is **11** (http://ace.ucv.ro/sdcb/doctoranzi.html). The advising committee of PhD students is provided by the 3 PhD supervisors in the field of study and 3 teachers (teaching and research staff) who do not have the quality of doctoral supervisors according to Anexa B.2.1.4.Comisiile de indrumare CTI. Thus, the result is a ratio of **11: 6** (PhD students / total number of teachers / researchers), less than 3: 1.

## B.3. The results of doctoral studies and their evaluation procedures

### B.3.1. Capitalizing on research results

**The research is capitalized by PhD students through presentations at scientific conferences, scientific publications, through technology transfer, patents, products, service orders.**

***B.3.1.1. For the evaluated field there is at least one article or other relevant contribution per PhD student who has obtained the title of doctor in the last 5 years. The members of the evaluation commission select for analysis, randomly, 5 such relevant articles / contributions per field of doctoral studies. At least 3 of the selected items present significant original contributions in the field of study.***

***Table B.3.1.*** presents a synthetic list of doctoral graduates in the field of study Computers and information technology, ***from which the thematic area of the theses result.*** All 5 doctors have carried out scientific papers presented at scientific conferences and / or published in journals,

with at least one relevant contribution existing from each doctor. As a result, all theses (except for the last thesis defended recently), were endorsed by CNATDCU and doctoral degrees were awarded after the first defense.

**Table B.3.1.** *List of PhD graduates in the field of study Computers and Information Technology (2015-2020)*

| Nr. crt. | Graduate | Thesis Title | PhD supervisor | Year | OM confirmation of title awarding |
|---|---|---|---|---|---|
| 1. | MANCAȘ Cătălina Felicia | Optimizarea performanțelor software în calculul virtual | Mocanu Mihai | 2018 | 3693/19.03.2019 |
| 2. | BAJI Faiq Sabbar | Features extraction techniques for medical images diagnosis and retrieval | Mocanu Mihai | 2018 | 3693/19.03.2019 |
| 3. | POPESCU Paul-Ștefan | Metode și instrumente de analiză a datelor pentru îmbunătățirea design-ului interacțiunilor în sistemele de e-learning | Mocanu Mihai | 2019 | 5748/13.10.2020 |
| 4. | BECHERU Alexandru | Complex networks analysis | Bădică Costin | 2019 | 4021/07.04.2020 |
| 5. | Constantinov Călin | Baze de date graf pentru modelarea și analiza datelor din rețelele sociale | Mocanu Mihai | 2020 | 3902/14.06.2021 |

The relevant contributions of the graduates of the Doctoral School in the field of Computers and information technology are presented in the lists and the folder with representative works from Anexa B.3.1.1_1, respectively Anexa B.3.1.1_2. The latter contains, for the evaluated field, two articles per doctoral student who has obtained the title of doctor in the last 5 years. The 5 graduates in the field of Computers and information technology in the last 5 years (2015-2020) capitalized on the research results by publishing a number of 78 papers: 16 articles in journals (12 in ISI journals, 4 in BDI journals), 2 book chapters in international publishing houses, and about 60 papers presented and published at international scientific events (mostly indexed by ISI Proc. and BDI).

***B.3.1.2. The ratio between the number of presentations of PhD students who completed their doctoral studies in the evaluated period (last 5 years), including posters, exhibitions, held at prestigious international events (held in the country or abroad), and the number of students PhD students who have completed their doctoral studies in the evaluated period (last 5 years) is at least equal to 1***

The number of doctoral graduates in the last 5 years in the field of Computers and Information Technology is 5 (Table B.3.1), and the number of presentations made by them or co-authors of their works at prestigious international events, held in the country or abroad, as it results from Anexa B.3.1.1_1, it is about 60. According to Anexa A.1.3.3_4. Table of training expenses SDCB_2016-2020, 17 mobilities of this kind were financially supported by SDCB or from other sources (research fund, faculty fund, etc.). To these are added a significant number of presentations made from other sources, or online presentations, especially during the pandemic, but not only. Without considering them, a minimum ratio of 17: 5 = **3.4, higher than 1**, results.

**B.3.2. External scientific references in the public support commissions**

**The doctoral school appeals to a significant number of external scientific references in the committee for the public defense of doctoral theses.**

***B.3.2.1. The number of doctoral theses assigned to a certain referent coming from a higher education institution, other than the evaluated IOSUD, does not exceed two (2) for the theses coordinated by the same PhD supervisor, in one year.***

| |
|---|
| The list of doctoral committees for public defense of doctoral theses in the field of study *Computers and Information Technology* (2015-2020) is presented (Anexa B.3.1.1.Lista absolvenţilor la doctorat în domeniul CTI (2015-2020)). The number of theses coordinated by the same doctoral supervisor, in one year, is in a single year of 2 (2018, Mihai Mocanu), in the other years there is at most one doctoral thesis coordinated by the same doctoral supervisor. Therefore, the criterion is met by default. |

***B.3.2.2. The ratio between the number of doctoral theses assigned to a certain scientific referent from another higher education institution than the one in which the doctoral thesis is organized and the number of doctoral theses defended in the same doctoral field within the doctoral school must not be higher than 0.3, by reference to the situation registered in the last 5 years. It is analyzed only if in the evaluated doctoral field at least 10 doctoral theses have been defended in the last 5 years.***

| |
|---|
| It's not necessary. The number of doctoral theses in the field os study, defended in the last 5 years, is 5. |

# C. QUALITY MANAGEMENT

## C.1. Existence and regular development of the internal quality assurance system

### C.1.1. Internal quality assurance

The institutional framework exists and a procedure for monitoring internal quality assurance as well as relevant internal quality assurance policies is applied.

***C.1.1.1. Doctoral school in which the field of doctoral studies falls is proof of the constant development of the process of evaluation and internal quality assurance in accordance with a procedure developed and applied at IOSUD level, among the evaluated criteria being mandatory:***

***a) the scientific activity of PhD supervisors***
At the IOSUD level, in the meeting of December 5, 2018, the “Procedure for the annual periodic internal evaluation of doctoral schools” was approved (Anexa C.1.1.1_1), which completes the provisions of art. 52 of the IOSUD Regulation (Anexa A.1.1.1_2) and establishes the indicators for evaluating the scientific activity of PhD supervisors. These are:

- the number of publications in relevant journals and the points accumulated in the grid for meeting the minimum standards for obtaining the qualification in force in the academic year subject to evaluation;
- the number of PhD students who have completed their studies within three years from the date of enrollment from the total number of coordinated PhD students and who have publicly defended the thesis;
- other activities relevant to the scientific activity of PhD supervisors;

***b) the infrastructure and logistics necessary to carry out the research activity;***

For this criterion, the aim is to analyze the way in which the doctoral school funds were used to improve the infrastructure and logistics necessary to carry out the research activity in the academic year subject to evaluation, and the main indicators are:

- organizing symposia, summer schools.
- purchases made to improve the material base.

***c) the regulations and procedures on the basis of which the doctoral studies are organized;***
The following indicators are taken into account for this criterion:

- analysis of the degree of fulfillment of the obligations mentioned in the curriculum by the PhD students coordinated by each PhD supervisor;
- analysis of the reasons why the doctoral research programs could not be completed within three years from the date of enrollment of the PhD students

***d) the scientific activity of PhD students***
For this criterion, the aim is to analyze the way in which the funds of the doctoral school were used to stimulate the scientific activity of the PhD students in the academic year subject to evaluation, and the main indicators are:

- the number of PhD students financially supported to publish / participate in conferences;
- the number of publications in volumes of the representative conferences in the field and in relevant journals;
- the number of PhD students who have completed their studies within three years from the date of enrollment from the total number of coordinated PhD students and who have publicly defended their thesis.

***e) training program based on advanced university studies of PhD students;***

It analyzes:

- observance of the procedures regarding the topic of the training program based on advanced university studies;
- the degree of completion of this training program by PhD students in each field.

***f) social and academic support services (including participation in various events, publication of articles, etc.) and counseling available to PhD students.***

During doctoral studies, feedback mechanisms are implemented by PhD students to identify their needs, as well as their level of satisfaction with the doctoral program, in order to continuously improve the academic and administrative services offered.

IOSUD The University of Craiova has developed and periodically applies an evaluation procedure and internal monitoring of the evolution of doctoral schools and their fields. For the School of Doctoral Studies “Constantin Belea”, the self-evaluation report contains a distinct chapter related to the field. For example, the 2016 Report, which can be viewed at Anexa_C1.1.1_2a contains the **CTI Domain Report** (Anexa_C1.1.1_2b). Additional elements are presented in Section 1.1 of this self-evaluation report, including the SDCB's annual reports for 2016-2019.

In the area of concerns for improving the educational process for the third cycle of studies - doctoral studies and for finding the best policies in this regard, is the first **National Conference of Organizing Institutions for Doctoral Studies organized by the Council for Doctoral Studies of IOSUD-University of Craiova**, on September 21-22, 2017, which enjoyed a wide participation from universities: http://www.cvlpress.ro/22.09.2017/organizata-in-premiera-la-craiova-conferinta-nationala-a-institutiilor-organizatoare-de-studii-universitare-de-doctorat/

****C.1.1.2. During the doctoral internship, evaluation mechanisms are implemented aimed at identifying the needs, as well as the general level of satisfaction with the doctoral studies program of phD students, in order to continuously improve the academic and administrative processes. Following the analysis of the obtained results, the elaboration and implementation of a plan of measures is proved.***

In order to improve the academic and administrative processes, mechanisms have been implemented for the evaluation of doctoral study programs by students by completing on-line, under anonymity, a questionnaire with 10 questions that can be accessed at https://chestionar.ucv.ro/.

In Anexa C.1.1.2_1 the questionnaire on the satisfaction of PhD students during the doctoral internship and a guide for completing this questionnaire is presented.

In Anexa C.1.1.2_2 we present a selection of the results (answers) obtained, those of the SDCB respondents, from the second part, being able to be compared with those received from all IOSUD PhD students.

Following the analysis of the results at the level of SDCB, in the previous years a series of

measures were taken, including the implementation of a private scholarship program QFORIT (implementation reports are in Anexa A.1.3.2_2017, Anexa A.1.3.2_2018, Anexa A.1.3.2_2019, Anexa A.1.3.2_2020). Also, in order to increase the applicability of research results, a POCU project was submitted and won with the title: “Entrepreneurial University - higher education and training system for the Romanian labor market by awarding scholarships for PhD students and postdoctoral researchers and implementing innovative entrepreneurial training programs”, POCU / 380/6/13/123990, 2019-2022. It is worth mentioning that this project includes two PhD students in the field of Computers and Information Technology: **Badea Gabriel** and **Pîrvu (Ilie) Mihaela-Ionela.**

## C.2. Transparency of information and accessibility to learning resources

### C.2.1. Availability of information in electronic format

The information of interest for PhD students, future candidates, respectively the information of public interest are available for consultation in electronic format.

***C.2.1.1 IOSUD publishes, on the website of the higher education institution, in compliance with the regulations in force regarding data protection, information such as:***

IOSUD - The University of Craiova ensures the transparency of information in compliance with the regulations in force by publishing on the institution's website information of interest to PhD students.

***a) doctoral school regulations;***

The regulations of the School of Doctoral Studies "Constantin Belea" are available on http://www.ace.ucv.ro/sdcb/regulamente.html .

***b) admission regulations;***

The doctoral admission regulations are an integral part of the university's admission regulations and are available on the IOSUD website https://www.ucv.ro/pdf/admitere/2022/Metodologie_proprie_de_admitere_2022-2023.pdf

***c) doctoral studies contract;***

In the three variants in use, it is available in Annex A.1.1.1. and on the IOSUD website https://www.ucv.ro/invatamant/educatie/programe_doctorat/admitere_contracte_studiu.php

***d) the regulation for completing the studies, including the procedure for public defense of the thesis***

The regulations for completing the studies and the procedure for public defense of the thesis are available on the SDCB website https://www.ucv.ro/pdf/invatamant/management/regulamente/Regulamente%20studii/Regulamentul_de_organizare_si_functionare_programe_studii_doctorat_al_IOSUD.pdf

***e) the content of training programs based on advanced university studies;***

The content of the study programs is available on the website of the School of Doctoral Studies "Constantin Belea" *http://www.ace.ucv.ro/sdcb/educatie.html*

***f) the academic and scientific profile, the thematic areas / research topics of the doctoral supervisors in the field, as well as their institutional contact data;***

The list of links to the web pages of the doctoral supervisors of the School of Doctoral Studies

"Constantin Belea" is available on http://www.ace.ucv.ro/sdcb/organizare.html .

***g)list of PhD students in the field with basic information (year of enrollment, leader);***

The list of PhD students from the School of Doctoral Studies "Constantin Belea" enrolled in the field of Computers and information technology is available on pagina Web a *SDCB: http://www.ace.ucv.ro/sdcb/doctoranzi.html*

***h)information about the standards for the elaboration of the doctoral thesis;***

The existing procedure at the level of the doctoral school, for the elaboration of the doctoral thesis, is presented in Anexa C.2.1.1 and http://www.ace.ucv.ro/sdcb/regulamente.html

***i) links to abstracts of doctoral theses to be defended publicly, as well as the date, time, place where they will be defended, at least 20 days before the defense.*** *They are published on the IOSUD website* https://www.ucv.ro/invatamant/educatie/programe_doctorat/programate.php

**C.2.2. Access to the necessary resources to carry out doctoral studies**

IOSUD / Doctoral School provides PhD students with access to the resources needed to conduct doctoral studies.

***C.2.2.1. All PhD students have free access to a platform with academic databases relevant to the field of doctoral studies subject to evaluation.***

All PhD students of IOSUD - Ucv have free access to a platform (portal) of academic databases, some being among the most significant for the fields of their doctoral studies. The access is made through the platform provided by the Association of Universities, Research-Development Institutes and Central University Libraries of Romania "ANELIS PLUS". (http://biblio.central.ucv.ro/bib_web/ro/Anelis_Plus.php ). Relevant sources in the field of Computers and Information Technology include: Science Direct Freedom Collection, Springerlink Journals, Institute Of Physics Journals, Web Of Knowledge (WoS, Journal Citation Reports, Derwent Innovations Index), SCOPUS, IEEE / IET Electronic Library (IEL) and so on.

***C.2.2.2 Each PhD student has access, upon request, to an electronic system for verifying the degree of similarity with other existing scientific or artistic creations.***

Each PhD student has access, upon request and with the consent of the doctoral supervisor, to an electronic system for verifying the degree of similarity with other existing scientific or artistic creations, respectively the Sistemantiplagiat.ro program, recognized by CNATDCU.
The connection to the system is made by accessing *sistemantiplagiat.ro*, and the theses are compared with the databases available for the system and a Similarity Report is issued. The similarity ratio indicates the percentage of fragments identified, as well as their exact length and source. The similarity report is analyzed and interpreted by the scientific supervisor together with the PhD student. The user manual of the *Sistemantiplagiat* program is presented in Anexa A.1.2.2., and in Anexa C.2.2.2 is presented the proof of acquisition of this software..

***C.2.2.3. All PhD students have access to scientific research laboratories or other facilities, depending on the specifics of the field / fields within the doctoral school, according to internal regulations.***

The access of PhD students to scientific research laboratories or other facilities, according to the internal regulations, is provided in the doctoral study contracts (the doctoral study contracts are presented, in the annexes from section A.1.1.1 point g, of this report: Anexa A.1.1.1_9a, Anexa A.1.1.1_9b and Anexa A.1.1.1_9c ).
Among the facilities that PhD students in the field of study Computers and Information Technology have, are access to a research center / laboratory in full internal restructuring in 2021 (CERCA - Interdisciplinary Research Center in Computers, Automation and Robotics) which has in its structure CATI Research Laboratory (Computers and Information Technology). In addition, there are two other existing research centers within INCESA: *Laboratory of Formal Intelligence Integration in Analysis, Testing and Certification of Computer Infrastructures and Laboratory of Computer Engineering*.
At the justified request of the PhD students, with the recommendation of the PhD sueprvisor, the access to the other laboratories of the University of Craiova can be ensured, depending on the specifics and needs of their research activities.
At the same time, students have access to the Library of the University of Craiova, an integrated part of the national higher education system that participates in the scientific research process from the university.

## C.3. Degree of internationalization

### C.3.1. Strategy for increasing the internationalization of doctoral studies

There is a strategy and it is applied to increase the degree of internationalization of doctoral studies

****C.3.1.1. IOSUD, for the evaluated field of study, has concluded mobility agreements with foreign universities, with research institutes, with companies that carry out activities in the studied field, aiming at the mobility of PhD students and teachers (for example, ERASMUS agreements for the cycle of Doctoral studies). At least 35% of PhD students have completed a training course abroad or another form of mobility, such as participating in international scientific conferences. IOSUD develops and implements policies and action plans aimed at increasing the number of PhD students participating in training courses abroad, up to at least 20%, which is the target at the level of the European Higher Education Area.***

1. The field of *Computers and Information Technology* through the School of Doctoral Studies Constantin has concluded *incoming* and *outging* mobility agreements with universities and research institutes abroad presented in Anexa_C.3.1.1. The list is subsequent to the one containing all the ERASMUS agreements made at the level of the Faculty of Automation, Computers and Electronics, as well as the one at the level of the doctoral school. Among the institutions with which agreements have been concluded, we mention:
   - Aristotle University of Thessaloniki, Greece

- Bulgarian Academy of Sciences, Bulgaria
- Comenius University on Bratislava, Slovakia
- Leuphana Universitaet Lueneburg, Germany
- University of Malaga, Spain
- University of Genoa, Italy
- Compiègne University of Technology, France
- University of Miskolc, Hungary
- University of Pardubice, Czech Republic

2. Students enrolled in the School of Doctoral Studies "Constantin Belea",field of *Computer and Information Technology*, have completed internships abroad or mobility in participation in international scientific conferences or summer schools. Of the 11 PhD students in internship (presented in **Table 1.4.b**), at least 5 participated in international conferences or training courses(see also Anexa A.1.3.3_4.Tabel cheltuieli formare SDCB_2016-2020 and the PhD student's file):
   - Ionuț Murarețu (*UPM Machine Learning and Advanced Statistics Summer School, Madrid, Spain, 2019*)
   - Felix Petcușin (*13th International Symposium on Intelligent Distributed Systems, Saint-Petersburg, Russia, 2019*)
   - Gabriel Badea (*18th International Conference on Information Technology Based Higher Education and Training), 2019, Magdeburg, Germania; 15th EATEL Summer School on Technology Enhanced Learning, 2019, Bari, Italia etc.)*
   - Carmen Dobre (*4th International Symposium on Emerging Technologies for Education, 2019, Magdeburg, Germania; 15th EATEL Summer School on Technology Enhanced Learning, 2019, Bari, Italia*)
   - Teodorescu Oana (*19th International Conference on Intelligent Data Engineering and Automated Learning, Madrid, Spania*)

   The ratio between the number of these PhD students (5) and that of PhD students in internship (11) is over 45%, so it exceeds 35%.
3. The list of PhD students in the field of study, in the period 2016-2021, who have completed an internship abroad or another form of mobility, such as mobility at international scientific conferences or summer schools, is longer if we taken into account the other PhD students (who in the meantime have defended the thesis or are in the stage of preparing it), and the ratio calculated above in other hypotheses will now increase.
   Regarding the mobility of PhD supervisors, in the period 2016-2021, numerous mobilities were held, at international conferences, as guest professors (Anexa_A.3.2.1_2 - Vizibilitatea internațională), as well as ERASMUS mobilities.
   IOSUD - UCv constantly develops and implements policies and measures aimed at increasing the number of PhD students participating in training courses abroad, through Erasmus programs and other types of agreements (with Asian and American states, for example), being implemented other programs that ensure the internationalization of studies

(for example, EEA, AUF Eugen Ionescu program with 6 SDCB fellows in the period 2015-2020 etc.). Thus, it is aims to increase the number of PhD students participating in internships abroad, up to at least 20%, which is the target at the level of the European Higher Education Area.

***C.3.1.2. Within the evaluated field of studies, it is supported, including financially, the organization of doctorates in international co-supervision, respectively the invitation of first-rate experts to give courses / lectures for PhD students.***

The Faculty of Automation, Computers and Electronics is a co-organizer of the International Conference on System Theory, Control and Computing, technically co-sponsored by the IEEE Control Systems Society, a conference that invites prominent personalities each year to give lectures to PhD students . (http://ace.ucv.ro/icstcc2020/speakers.php).
Also, special sessions are organized dedicated to PhD students and young researchers, an example being the Round Table session: Young Researchers Meetup in Control Engineering and Computer Science within ICSTCC 2020.
(https://controls.papercept.net/conferences/conferences/STCC20/program/STCC20_ProgramAtAGlanceWeb.html). In 2021, a workshop dedicated to the PhD students of the School of Doctoral Studies “Constantin Belea” will be organized: *1st International Doctoral Workshop on Advanced Approaches in Robotics, Control and Computing - $A^2RC^2$*. During this workshop prestigious lectures such as Andrzej BARTOSZEWICZ (Institute of Automatic Control, Lodz University of Technology, Poland), Paolo MERCORELLI (Control and Drive Systems Unit, Institute of Product and Process Innovation, Leuphana University of Lüneburg, Germany), Sorin Olaru (CNRS Laboratory of Signals and Systems, CentraleSupélec, Paris-Saclay University, France), Ramon VILANOVA I ARBOS (Department of Telecommunication and Systems Engineering, Autonomous University of Barcelona, Spain) agreed to give a lecture.
The benefits of the co-supervision system at the field level are also highlighted by the fact that during the reference period Professor Popescu Elvira defended her habilitation thesis in the field of Computers and Information Technology and was affiliated to SDCB, whose doctoral thesis, Adaptive Dynamic Hypermedia Systems for e-learning, was coordinated by Prof. univ. dr. eng. Vladimir Răsvan (University of Craiova) and Prof. univ. Dr. Trigano Philippe (Technological University of Compiègne, France).

***C.3.1.3. The internationalization of activities within doctoral studies is also supported by other concrete measures (for example, participation in educational fairs to attract international PhD students; inclusion of international experts in advisory or defending doctoral theses, etc.).***

In order to raise the level of activities within the doctoral studies and to intensify the internationalization activities, in the Council of the Doctoral School “Constantin Belea” was included starting with 2016, an international specialist in one of its fields: http://ace.ucv.ro/sdcb/organizare.html : Prof. dr. Silviu NICULESCU, L2S-Centralesupelec, France: https://l2s.centralesupelec.fr/u/niculescu-silviu-iulian/ .
The increase of the number of foreign doctoral students in the field of CTI of SDCB was also possible by attracting them to some projects and topics of interest, through discussions during the

participation in inter-university events. In 2018, PhD student Faiq Baji Sabbar, from Baghdad, Iraq, defended his thesis under the coordination of Prof. Dr. Eng. Mihai Mocanu, thesis confirmed by CNATDCU (see Table B.3.1 in section B.3.1.1), and PhD students Humam Majeed and Hussein Aqeel Mohammed are in the extension period for writing their doctoral thesis, respectively in the training stage. All three participated in events at the Polytechnic University of Bucharest, or even attended courses in Bucharest, before enrolling in doctoral studies at our university.

One of the directions for promoting internationalization is to conclude new Erasmus + contracts and projects, such as those presented in point C.3.1.1, through which to organize thematic events and to invite foreign specialists to the advisory and doctoral committees of theses.

Another measure to intensify internationalization is to attract associate researchers from the University of Craiova, from traditional university centers abroad, who can train a better dynamic of the doctoral school.

## 3. Strategies and procedures implemented at the level of doctoral university studies

*This section of the report presents some measures for continuous improvement of the quality of doctoral study programs, other than those provided by the minimum standards, regulated by Annex no. 2 of the Order of the Minister of Education and Research no. 3651 of April 12, 2020, published in the Official Gazette no. 414 of April 20, 2021.*

These are measures at the level of the doctoral school that aim at four main directions of action that allow the achievement of the objectives of increasing the quality of doctoral programs and research performance, by organizing and conducting specific events with important contribution.

### 3.1. Workshops, doctoral symposia and dedicated publications

The National Symposium on Systems Theory (SINTES), the traditional event organized by the Faculty of Automatics from Craiova, which had almost 25 editions, was incorporated in the annual conference ICSTCC (International Conf. On System Theory, Control and Computing), which is organized by the "Gheorghe Asachi" Technical University of Iași (through the Faculty of Automatics and Computers), the "Dunărea de Jos" University of Galați (through the Faculty of Automatics, Computers, Electronics and Electrical Engineering), the Polytechnic University of Timișoara (through the Faculty of Automation and Computers), respectively the University of Craiova (through our faculty). In 2021, a jubilee edition will take place in Iași, which will, like previous editions, have an important participation of PhD students from several university centers (Joint Conference of SINTES 25, SACCS 21, SIMSIS 25, CONTI 14. Oct.20– 23, 2021, Iași, Romania: Hybrid event). The conference proved to be a very good tool for PhD students given the fact that from October 1, 2018 there are clear criteria for defending doctoral theses; In addition, starting in 2020, the decision was made to found a bi-annual journal, System Theory Control and Computing Journal (STCCJ), which could take extensions of the best papers presented at the conference, but also others. This journal will incorporate, in a form that is intended to be better, the following scientific journals from the four university centers:

- Annals of The University of Craiova, Series: Automation, Computers, Electronics and Mechatronics, http://ace.ucv.ro/anale/
- Scientific Bulletin of The Politehnica University of Timisoara, Romania, Transactions on Automatic Control and Computer Science, https://bulletin-ac-upt.netlify.app/
- The Annals of University “Dunărea de Jos” of Galati, Fascicle III Electrotechnics, Electronics, Automatic Control and Informatics, http://www.ann.ugal.ro/eeai/index.html
- Bulletin of the Polytechnic Institute of Iasi, Automatic Control and Computer Science Section, http://www.ace.tuiasi.ro/index.php?page=678&lang=en

There are also other publishing opportunities, such as publishing the research results of PhD students in dedicated journals, for example Journal of Young Researchers, journal of the University of Craiova (https://www.ucv.ro/cercetare/programe_de_cercetare/jyr.php ) .

In preparation for the participation of PhD students in these scientific events, they have the opportunity to present the research results in the scientific seminars of the Department of *Computers and Information Technology* as well as other departments of the Faculty of

Automation, Computers and Electronics. Thus, PhD students can debate some of the achievements of the research activity, in a broader framework provided by the doctoral school.
It has been in the attention of the Faculty of Automatics, Computers and Electronics and the School of Doctoral Studies "Constantin Belea" for a long time the organization of symposia and workshops with companies in the IT field, to present the results of PhD students. Such a symposium was organized by the Faculty of Automation, Computers and Electronics and the School of Doctoral Studies "Constantin Belea" in 2018, in collaboration with QFort and other IT and related companies (QForIT-FACE Symposium - Anexa_3.1). During the Symposium, research projects of doctoral and post-doctoral students in the field were presented, to evaluate the degree of innovation and to identify ideas for possible startups.

At the same time, at the level of IOSUD - Ucv we can say that there is a coherent strategy of connecting doctoral schools to national research efforts and to creating links at national and international level. The first national conference of institutions organizing doctoral studies was organized in Craiova, between 21 and 22 September 2017, where rectors, IOSUD directors, directors of doctoral schools from more than 40 universities from the country participated, along with PhD students.

### 3.2. Seminars, meetings, regular debates of the members of the Doctoral School with representatives of the socio-economic environment from the Oltenia region

The objectives pursued are to establish sustainable partnerships with economic agents on various national and international research projects; common solution for different research topics with respect to intellectual and industrial property rights, as well as promotion of innovative ideas of PhD students among economic agents. These meetings resulted in collaboration offers (Q4IT) and research topics that can be solved in partnership (CONTI); a series of economic agents sent to the doctoral school the educational offer in order to grant scholarships to PhD students and to carry out in partnership some research topics even on the topic of some doctoral theses.

The QforIT private doctoral scholarship system (described in section A.1.3.2_1 - see also annexes) is a model that will be continued so as to make as strong a link as possible between doctoral studies and areas of application in industry. In 2020, collaboration agreements were signed / extended by the University of Craiova and the Faculty of Automation, Computers and Electronics with strategic partners (Anexa 3.2_1**,** Anexa 3.2_2), the agreements having provided special chapters dedicated to research and doctoral programs. For example, the partnership agreement concluded with Continental Automotive Sibiu provides for collaboration procedures in the doctoral field, such as:

- defining specific doctoral research programs at the beginning of the academic year;
- establishing doctoral research topics of technical-scientific interest, by mutual agreement between the management of Continental Automotive and the PhD supervisors;
- periodic presentation by PhD students of research contributions, in the presence of invited specialists from Continental;

- supporting from Continental (in collaboration with the doctoral school) in disseminating the results of doctoral research through prestigious conferences and journals;
- publication of double-affiliated scientific articles for PhD students working for Continental;
- patenting common research results through negotiation, on a mutually beneficial basis.

### 3.3 Collaboration with national research institutes for research and PhD programs

The strategy of the University of Craiova and the Doctoral School in recent years includes the conclusion of new agreements with strong research institutes, such an agreement being concluded in 2020 with the *National Institute for Research and Development in Informatics (ICI) Bucharest* (Anexa 3.3_1), which aims to identify new areas of smart specialization, participate in funding programs from reimbursable and non-reimbursable funds, common organization of symposia and scientific communications, work to establish cooperative relationships with institutions in Romania and abroad for promotion and execution of research programs and projects. In this context, ICI invited members of the academic community and especially members of the Doctoral School to contribute to the publication of research results in prestigious journals in the field, published under the auspices of ICI Bucharest (Anexa 3.3_2): *Studies in Informatics and Control* (ISI, Q2) and the *Romanian Journal of Informatics and Automation* (Emerging Source Citation Index - ISI).

### 3.4 Alternative procedures for evaluating scientific research

At the level of IOSUD - UCv there were established in 2020 *Alternative procedures for evaluating the doctoral scientific research activity of PhD students, until the approval of the public defense of the doctoral thesis and the approval of the public doctoral committee* (Anexa_3.4):https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/informatii/I_Proceduri_de_evaluare_a_activitatii_de_cercetare_st_doctorala.pdf.
These procedures, applicable to the field of *Computers and Information Technology*, are provided to ensure the proper conduct of doctoral work during periods of emergency and alert caused by the Covid-19 pandemic.

## 4. Additional information

This section presents (optionally) a number of other information relevant to the field of doctoral studies.

We consider a SWOT Analysis might be useful.

**STRENGTHS**

- Experience in the field of doctoral studies: almost 30 years of uninterrupted operation of the bachelor-master-doctorate cycle.
- The study program defines a modern direction, with international correspondence.
- The study program prepares specialists required by higher education, research and

the socio-economic-industrial, national and European environment.

- PhD supervisors with experience in the field, but also young ones, with specializations and international visibility.
- PhD students with a very good level of training and with research results disseminated in impact publications
- The material base with modern facilities, equipment, laboratories, library and access to international databases, as well as the existence of the INCESA research infrastructure
- Visibility of the field of doctoral studies, ensured including by organizing internationally recognized conferences
- Development of collaboration with strong companies in the field (doctorate training, laboratory equipment and infrastructure).
- Providing additional incentives for high-performing PhD students (QForIT scholarship system, POCU scholarships).

**WEAKNESSES**

- Obtaining qualifications and affiliation of new PhD supervisors are affected by stricter minimum qualification standards compared to other engineering fields.
- Lack of PhD theses in international co-supervision (but there are collaboration initiatives).
- Part of the infrastructure of the faculty/doctoral school is in the process of rehabilitation.

**Opportunities**

- The national and European context, in which the development of Computers and information technology is considered a priority.
- Favorable local situation through the openings offered, from an economic and social point of view.
- Completion of the campus rehabilitation project (POR project) through which the field of study will benefit from new and modern educational spaces.

**Threats**

- Competition of similar fields of study at national and European level.
- The decline of young people's interest in higher technical education in general, for the doctoral cycle in particular, combined with age-specific practical aspects and the effects of the pandemic.
- The reduction of national funding for research activity, with consequences at the level of teaching staff as well as doctoral students.

## 5. Opis annexes

The annexes, in electronic format, with access through links included in the text of the internal evaluation report, contain documents and data that substantiate the information presented in the internal evaluation report.

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