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PERIODIC SELF-EVALUATION REPORT
for
MAINTENANCE OF ACCREDITATION
OF THE DOCTORAL FIELD OF
SYSTEMS ENGINEERING

Endorsed by
the Quality Assurance Committee of the University of Craiova (CEAC-UCv)
in the meeting of 28.05.2021.

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"CONSTANTIN BELEA" DOCTORAL SCHOOL
FIELD: SYSTEMS ENGINEERING
FACULTY OF AUTOMATION, COMPUTERS AND ELECTRONICS
Craiova, Blvd. Decebal 107, 200440, http://www.ace.ucv.ro/

PERIODIC SELF-EVALUATION REPORT
for
MAINTENANCE OF ACCREDITATION
OF THE DOCTORAL FIELD OF SYSTEMS ENGINEERING

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Director of the "Constantin Belea" Doctoral School Professor Eng. Costin Bădică, PhD

April 2021

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List of abbreviations

ACE	Automation, Computers and Electronics
ANSI	Nonlinear Automatic Research and Intelligent Systems
ANSO	Nonlinear Automation. Stability and Oscillations
AUF	Agence Universitaire de la Francophonie
CEAC	Committee of Quality Assurance, Academic Evaluation and Accreditation
CERCA	Interdisciplinary Centre for Research in Computers, Automation and Robotics
CNATDCU	National Council for Attesting the University Titles, Diplomas and Certificates
CNCSIS / CNCS	National Council of Scientific Research
CSD	Doctoral School Council
CSUD	Council of Doctoral Studies
CTI	Computers and Information Technology
DAE	Department of Automation and Electronics
DMC	Department of Quality Management
EERIS	Engage in the European Research Infrastructures System
EUA	European University Association
FACE	Faculty of Automation, Computers and Electronics
ICSTCC	International Conference on System Theory, Control and Computing
IEEE - CSS	Institute of Electrical and Electronics Engineers - Control Systems Society
IFAC	International Federation of Automatic Control
INCESA	Research Hub of Applied Sciences
IOSUD	Institution Authorised to Organise Doctoral Programmes
IS / SE	Systems Engineering
MR	Mechatronics and Robotics
PNCDI	National Plan for Research, Development and Innovation
SDCB	“Constantin Belea” Doctoral School
SRAIT	Romanian Society of Automation and Technical Informatics
UCv	University of Craiova
UEFISCDI	Research and knowledge transfer in the area of software technologies and tools for industrial processes

1. General information

1.1. DOCTORAL SCHOOL "CONSTANTIN BELEA"

1.1.1. Establishment

The higher education system in the field of Automation at the University of Craiova has been developing since the academic year 1966 -1967 with the establishment of the specialization of Automation. In the academic year 1976-1977, with the implementation of a new curriculum, two programmes were introduced: Automation and the Computers, and the specialization was renamed Automations and Computers. The key role in the development of the Automation and Computers specialization is attributed to the late Professor Doctor Docent Engineer Constantin Belea, founder of the School of Automation in Craiova.

The current structure of the **"Constantin Belea" Doctoral School** was set up at the University of Craiova by bringing together the three main fields of the Faculty of Automation, Computers and Electronics in a single Doctoral School: *Systems Engineering*, *Computers and Information Technology*, and *Mechatronics and Robotics*, in compliance with the provisions of the Law on National Education no. 1/2011 and as effect of Government Decision no. 681/2011 on the Code of doctoral studies. Initially, starting from October 2012, the new Doctoral School operated within the Doctoral School of Engineering Sciences (Establishment Decision – **Annex 1.1.1**), subsequently managed as a separate Doctoral School, directly subordinated to IOSUD – University of Craiova, in accordance with the decision of the Senate of the University of Craiova of 29.09.2015 (**Annex 1.1.2**). MENCS Order no. 5382/17.11.2016 establishes the structure of IOSUD – University of Craiova that integrates the "Constantin Belea" Doctoral School (**Annex 1.1.3**).

1.1.2. Evolution

With a relatively young history, the "Constantin Belea" Doctoral School developed under the guidance of prominent scholars in the field of Automation. In 1968, Professor Constantin Belea was awarded the title of Doctoral supervisor in the field of Automated Systems at the University of Craiova. In the period since this landmark event, the doctoral activity has developed constantly. Some of the teaching staff of the Automations and Computers Department at the time were awarded the title of Doctor Engineer under the guidance of Professor Constantin Belea. The first doctoral thesis in Automated Systems supervised by Professor Constantin Belea was defended in 1974 by Professor Mircea Ivănescu, who was awarded the PhD title in 1975. The number of PhD supervisors has increased substantially after 1989. Thus, in 1993 Professors Vladimir Răsvan, Mircea Ivănescu, Matei Vînătoru were granted the title of PhD supervisors in Control Systems, and in 1994 Professor Mircea Petrescu was granted the title of PhD supervisor in Computers. In 2005, Professor Marin Constantin was awarded the title of PhD supervisor in Control Systems. Subsequently, in 2007, Professors Costin Badică and Mihai Lucian Mocanu were awarded the title of Doctoral supervisors in Computers and Information Technology, and in 2008 Professors Dorian Cojocaru, Nicu George Bîzdoacă and Mircea Nițulescu were awarded the title of Doctoral supervisors in Mechatronics and Robotics. At the same time, in 2008, Professors Dan Popescu and Emil Petre were awarded

the title of Doctoral supervisors in Systems Engineering, and Professor Dumitru Dan Burdescu in Computers and Information Technology. In 2016, Professor Dan Selișteanu was awarded the habilitation certificate in Systems Engineering and affiliated in the same year with the Doctoral School "Constantin Belea". In 2018, Professor Elvira Popescu was awarded the habilitation certificate in Computers and Information Technology and affiliated with the Doctoral School in the same year. In 2018, Professors Monica Roman and Dorin Şendrescu defended their habilitation theses in the field of Systems Engineering. In 2019, following the issuance of their habilitation certificates, they affiliated with the Doctoral School. Also in 2018, Associate Professor Sorin Grigorescu from the "Transilvania" University of Brașov was awarded the habilitation degree certificate in Mechatronics and Robotics and affiliated with our Doctoral School in the same year. In 2019 Professor Daniela Danciu was awarded the habilitation degree certificate in Systems Engineering and was affiliated with the Doctoral School. In 2020, Senior Lecturers Gigel Măceșeanu and Tiberiu Teodor Cociaș from the "Transilvania" University of Brașov were awarded the habilitation certificate in Mechatronics and Robotics at the "Constantin Belea" Doctoral School. Subsequently, Senior Lecturers Gigel Măceșeanu and Tiberiu Teodor Cociaș together with Assoc. Professor Sorin Grigorescu decided to set up a Doctoral School on Mechatronics and Robotics at the University of Brașov.

1.1.3. Organization

1.1.3.1. Doctoral Supervisors

11 Doctoral supervisors activate within the Doctoral School "Constantin Belea", in 3 doctoral fields as follows:

- 5 Doctoral supervisors in the field of Systems Engineering
- 3 Doctoral supervisors in the field of Computers and Information Technology
- 3 Doctoral supervisors in the field of Mechatronics and Robotics

Table 1.1. shows the list of Doctoral supervisors.

Table 1.1. List of Doctoral supervisors – SDCB

No.	First name	Last name	Affiliation	Order / date
1. Computers and Information Technology				
1.	Costin	BĂDICĂ	Faculty of Automation, Computers and Electronics (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

1.1.3.2. The Council of the "Constantin Belea" Doctoral School

The Council of the "Constantin Belea" Doctoral School consists of 3 members of the Doctoral School (Doctoral supervisors), an external member (Doctoral supervisor), and a PhD student enrolled to the Doctoral School. The Council of the Doctoral School is structured as follows:

PhD supervisors from the University of Craiova

- Professor Eng. Costin BADICĂ - director of the Doctoral School, Doctoral supervisor in Computers and Information Technology
- Professor Eng. Dorian COJOCARU (Mechatronics and Robotics)
- Professor Eng. Daniela DANCIU (Systems Engineering)

External members

- Professor Silviu NICULESCU, PhD, Control Systems, L2s-CentraleSupelec, France, https://l2s.centralesupelec.fr/u/niculescu-silviu-iulian/

PhD students

- Professor Eng. Radu Lucian CONSTANTINESCU, PhD (Systems Engineering)

1.1.3.3. Doctoral students

In the period 2015-2020, the "Constantin Belea" Doctoral School totalled a number of 15 graduates (3 female graduates and 12 male graduates), distributed as follows:

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

More than 20 theses in all three doctoral fields are in progress. All doctoral theses publicly defended by the candidates of our Doctoral School have been validated by CNATDCU.

The intense scientific activity carried out by our Doctoral students resulted in the publication, as authors or co-authors, of more than 150 scientific papers in ISI-indexed journals and conference proceedings and more than 100 scientific papers in journals and conference proceedings indexed in international databases.

1.1.4. Research Mission

The SDCB Mission is in line with the Mission of IOSUD and the University of Craiova fostering specialists' training underpinning research and education development in the fields of Computers and Information Technology, Systems Engineering and Mechatronics and Robotics. The main objectives of the SDCB aim at:

- High-quality academic training of Doctoral students to enhance theoretical, professional and interpersonal competences in compliance with current market requirements for highly specialized workforce;
- Doctoral students' training to join research programmes;
- Promoting excellence through scientific research, development strategies, innovation and transfer of knowledge to meet the society growth needs in Romania;
- Innovation in research, technology advancement and knowledge transfer to strengthen the knowledge-based society and the European Research Area;
- The development of young human resources, involved in academic and research activities, enhancing the status of the research profession.

1.1.5. Quality certification level

In Romania, a number of 97 universities (7 of which are in liquidation) operated in 2020: 54 public universities (including military ones) and 43 private universities (9 of which are provisionally authorized). The University of Craiova is a University enjoying a well-established tradition and the first institution of its type at the regional level, consistently ranked among the top 8-10 universities in Romania: among the top 8 universities in Romania – *Level One Institutions* in the 2000s, among the top 10 universities in Romania in 2020 and 2021 and in the *uniRank* classification that lists 78 Romanian universities. The global ranking is established according to web-based trust/authority, institutional accreditation, provision of courses mainly in a traditional face-to-face learning format delivered through on-site facilities https://www.4icu.org/reviews/3936.htm

In 2009 the University of Craiova underwent for the first time the process of the periodic external evaluation carried out by ARACIS (Romanian Agency for Quality Assurance in Higher Education). Following the evaluation, the ARACIS Council issued the Certificate awarding the "high degree of confidence", please visit: https://www.aracis.ro/ev_institutionala/University-of-craiova-2009/.

In 2011, following the independent evaluation (the National Research Assessment Exercise – ENEC) conducted by UEFISCDI (the Executive Unit for Financing Higher Education, Research, Development and Innovation) through a project financed by Structural Funds, the University of Craiova achieved outstanding results in the evaluation of research and doctoral programmes. Within the engineering-related fields, the University of Craiova top ranked (Field P17: Systems Engineering - position 5, Field P18: Computers and Information Technology - position 5, Field P7: Mechanical and Mechatronics Engineering - position 7).

In 2012, within the "Performance in Research, Performance in Teaching – Quality, Diversity, and Innovation in Romanian Universities" project funded by Structural Funds (UEFISCDI), the University of Craiova was evaluated by the European University Association (EUA) via the Institutional Evaluation Programme (IEP), listed in The European Quality Assurance Register for Higher Education https://cis01.central.ucv.ro/eval_internationala/#.

In 2015 the University was evaluated by ARACIS, and following the External Quality Evaluation Report, available on https://www.aracis.ro/ev_institutionala/universitatea-din-craiova-2015, the ARACIS Council awarded the "High degree of confidence" to our institution.

In the period 2015-2019, all 7 Bachelor's programmes of the Faculty of Automation, Computers and Electronics were externally evaluated by ARACIS, all 7 programmes maintained their accreditation, and some of them increased the number of student places. The Faculty of Automation, Computers and Electronics offers 6 Master's programmes in the 3 main academic fields of the Faculty. In 2019, ARACIS carried out the periodic external evaluation procedure of the Master's fields, following which all our Master's programmes maintained their accreditation.

1.1.6. Quality management measures and promotion of ethical conduct and integrity

The quality assurance and management at the level of the SDCB is governed by the *Internal Regulation on the Organization, Operation, and Quality Assurance of the "Constantin*

Belea" Doctoral School, Faculty of Automation, Computers and Electronics, University of Craiova – **Annex 1.1.4** (see also section 1.3 of this Report). Thus:

(1) The SDCB Director shall annually draft a self-evaluation report of the school, to be submitted to the Council of the Doctoral School, subject to the approval of the SDCB Council. The report evaluates the efficiency and effectiveness of the quality assurance procedures and structures, as well as their impact on the doctoral programme activities.

(2) The conclusions of the annual Self-Evaluation Report are analysed by the Council of the Doctoral School in order to identify problems and solutions for continuous quality improvement at the SDCB level.

(3) The internal quality assurance and monitoring policy of SDCB is transparent, compliant with the regulation articles on clear and quantifiable criteria to be fulfilled by Doctoral supervisors, doctoral students and research performance.

(4) The internal quality assurance and monitoring at SDCB is carried out through:
(a) Periodic evaluation of the SDCB Doctoral supervisors, in accordance with Art. 3, paragraphs (3) to (6).
(b) Periodic evaluation of the quality of the doctoral programmes, according to Art. 7 and Art. 9 paragraphs (1), (2), (6) and (7).
(c) Periodic evaluation of the quality of the research performance of the Doctoral students, according to Art. 4, Art. 7 (5), Art. 8, Art. 9 paragraphs (1), (3), (4), (6).
(d) Periodic evaluation of the quality of the research performance of the Doctoral students, according to Art. 9 paragraphs (1), (4), (5), (6), Art. 10, Art. 11.

(5) The SDCB Regulation is closely related to the Quality Assurance and Management System implemented by the University of Craiova, according to Art. 1 paragraphs (3), (4).

(6) Prominent members of the IOSUD University of Craiova, academics from the country or abroad and Doctoral students may attend the meetings of the SDCB Council without having the right to vote.

Samples of annual reports (2017, 2018) as well as the SDCB Self-Evaluation Reports of 2016 and 2019 are presented in **Annex 1.1.5**.

1.1.7. Human Resources

The SDCB human resource consists of the 11 full-time Doctoral supervisors in the doctoral fields at SDCB (3 female supervisors and 8 male supervisors), of which: 5 PhD supervisors in the field of Systems Engineering, 3 PhD supervisors in the field of Computers and Information Technology, and 3 PhD supervisors in the field of Mechatronics and Robotics.

Furthermore, 9 experienced teaching staff members of the Faculty of Automation, Computers and Electronics (2 female professors and 7 male professors), with extensive experience in the above-mentioned research domains, participate in Advisory committees: 3 teaching staff members in the field of Computers and Information Technology, 3 in the field of Systems Engineering, and 3 in the field of Mechatronics and Robotics. Full information on the human resource is presented in Section A3 of the Report.

1.1.8. Research Infrastructure

The "Constantin Belea" Doctoral School capitalizes on the infrastructure provided by the research centres linked to each of its fields of study, the Research Hub of Applied Sciences (INCESA) and the teaching staff of the Faculty of Automation, Computers and Electronics, some of them being members of the Advisory committees. At the same time SDCB benefits from the teaching facilities of the ACE Faculty that provides lecture halls and seminar rooms and laboratories suitable 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 at the University of Craiova. Hence, the research activity capitalizes on the research centres and laboratories of the ACE Faculty and SDCB.

At the level of the Faculty of Automation, Computers and Electronics, the University of Craiova, the following research centres operated between 2015 - 2020:

- Nonlinear automation, stability and oscillations (ANSO), in the field of Systems Engineering, CNCSIS certificate of 11.02.2001 (certificate no. 19 / CC-B) and CNCSIS re-accreditation on 12.09.2006 (certificate no. 10), see **Annex_1.1.6a**;
- Development of multimedia applications (DAM), in the field of Computers and Information Technology, accredited by CNCSIS on 12.09.2006, see **Annex_1.1.6b**.
- Mechatronics and robotics (CCMR), in the field of Mechatronics and Robotics.

In 2021, the research centres were restructured following an internal procedure that set up the Research Centre at the Faculty of Automation, Computers and Electronics, i.e., the ***Interdisciplinary Centre for Research in Computers, Automation and Robotics (CERCA)***, following the internal evaluation (March-May 2021). The Research Centre integrates three research laboratories in each field of study – CTI, SE and MR) - see also Section 1.2 of the Self-Evaluation Report.

Details on the research infrastructure in the fields of Computers and Information Technology, Systems Engineering and Mechatronics and Robotics are provided in Section 2 (A2) of the present Report.

1.1.9. Educational efficiency and effectiveness

The Doctoral candidates that were awarded the PhD title at the University of Craiova between 2011-2020, under the guidance of the Doctoral supervisors of SDCB, currently work in universities, research institutes or field-related companies, as follows:

- Academic environment: 17
- Research institutes and schools: 2
- Industry: 19

The educational efficiency and effectiveness of each doctoral field in SDCB are highlighted in Section 2 (B) of the current Self-Evaluation Report.

1.2. Doctoral Field: Systems Engineering

The Doctoral Field of Systems Engineering is embedded to the "Constantin Belea" Doctoral School of the Faculty of Automation, Computers and Electronics. This **Self-evaluation Report of the Doctoral Field of Systems Engineering** was approved in the CSD meeting of 23.04.2021, in the CSUD meeting of 26.04.2021 and by the Decision of the Senate of the University of Craiova of 27.04.2021 (where the Self-evaluation Reports of IOSUD and of the others Doctoral Fields were also approved) – **Annex 1.2**.

In what follows we shall briefly describe the mission and objectives of the Doctoral School in the field of Systems Engineering, the curricula, the Doctoral supervisors, the dynamics of the number of the Doctoral students and PhD title awards in the last 5 years, the research centres/laboratories, and the main scientific achievements. Extensive information on the Doctoral School in the field of Systems Engineering fulfilment of criteria, standards and performance indicators is reported in Section 2 of the Self-Evaluation Report.

1.2.1. Mission and Objectives

The Doctoral School in the field of Systems Engineering has steadily developed in the last few years. As stated in the previous sections, the current "Constantin Belea" Doctoral School (SDCB) was established following the regrouping of the three doctoral fields - Systems engineering, Computers and Information Technology, and Mechatronics and Robotics - in a single Doctoral School within the Faculty of Automation, Computers and Electronics. SDCB separated from the Doctoral School of Engineering Sciences, based on the Decision of the Senate of the University of Craiova in 2015, being directly subordinated to IOSUD – University of Craiova.

Notwithstanding, the mission, objectives and the current curriculum of the Doctoral field of Systems Engineering are the result of a long-lasting evolution inaugurated by the award of the Doctoral supervisor title to Professor Constantin Belea at the University of Craiova, in the field of Automated Systems (1968). It has been strengthened through the efforts and achievements of some prestigious Doctoral supervisors - Professor Mircea Ivănescu, PhD, Professor Vladimir Răsvan, PhD, Professor Constantin Marin, PhD, Professor Matei Vânătoru, PhD, Professor Emil Petre, PhD - between 1990-2020, and through the contributions of the current Doctoral supervisors. In the last 50 years, 87 doctors in the field of Systems Engineering (respectively Automation) have graduated from the University of Craiova.

The mission of Systems Engineering Doctoral Field is aligned with the Mission of the University of Craiova (as defined in the University of Craiova Charter – **Annex 1.2.1 1**), the Mission of the Faculty of Automation, Computers and Electronics (as defined in the Strategic Plan for the development of a Faculty – **Annex 1.2.1 2**), as well as the Mission of the "Constantin Belea" Doctoral School. The teachnig and scientific research Mission is clearly highlighted in the curricula of the "Constantin Belea" Doctoral School, the field of Systems Engineering (**Annex A.3.1.3 1**).

The specific Mission of the Doctoral Field is to train highly qualified specialists in the field of SYSTEMS ENGINEERING to meet the requirements and principles of the European Higher

Education Area with a view to research development, innovation and education advancement underpinning interdisciplinary research approaches in various fields of science and engineering: advanced control (adaptive, robust, and predictive), intelligent control, embedded control systems, and applications of control systems in industry, biomedicine and other related fields.

In accordance with the mission undertaken, the Doctoral field of Systems Engineering has set some main objectives both in terms of teaching and scientific research performance. *The main objectives* pursued within the Doctoral field of Systems Engineering are in accordance with the Mission and Objectives of the University of Craiova, the "Constantin Belea" Doctoral School and the Faculty of Automation, Computers and Electronics, as well as with the requirements of the highly qualified labour market:

- To ensure the quality of scientific research and teaching via adequate university and research management, with a focus on excellence in research-development and innovation;
- to widen and enhance theoretical knowledge acquisition in the field of Automation, to meet the requirements of the highly qualified labour market that integrates fundamental research, applied research and technological innovation;
- to build up solid research competences that ensure our graduates' access to teaching and research activities in higher education environments, in research institutes and companies;
- to participate in national and international research-development-innovation programmes, projects and partnerships, including with the business environment;
- to improve the quality of publications, the dissemination range of the scientific research outcomes and the visibility of our teaching staff and doctoral students.

The Doctoral field of Systems Engineering achieves the mission and the objectives by promoting a set of principles stipulated in the University of Craiova Charter among the teaching staff and doctoral students, i.e., the principle of academic freedom, the principle of student-centred education, the principle of transparency and equity, students' and teaching staff rights, the principle of freedom of speech and critical thinking.

1.2.2. Curricula

The curricula in the Doctoral field of Systems Engineering are included in the curricula of the "Constantin Belea" Doctoral School; **Annex A.3.1.3_1** shows the curriculum development in the last 5 years. The training programme (academic subjects, reports, projects and publications) in the current curriculum is based on the main research directions, as defined at the level of the Faculty of Automation, Computers and Electronics (Research Plan 2020-2024 – **Annex 1.2.2_1**), and the Department of Automation and Electronics (DAE): DAE Research Plan – **Annex 1.2.2_2**. Thus, the DAE Research Plan outlines three major research directions:

D1. Nonlinear automatics, fault-tolerant systems and real-time systems;

D2. Intelligent measurement and monitoring systems, modelling, simulation and design of electronic circuits, software tools for automatic design of microelectronic circuits;

D3. Intelligent systems.

The three main directions are further developed via research sub-directions with definite potential for applicability (Annex 1.2.2_2). The curriculum of Doctoral field in Engineering Systems is mainly focused on the D1 and D3 directions that enable the development of control systems applications in industry (automotive, chemical processes, nuclear and conventional energy, electrical machines, and drives), in biology, biotechnology, environment and medicine.

The curriculum contains compulsory, optional and elective subjects, as indicated by each Doctoral supervisor (depending on the topic addressed), research activities and individual study. All subjects in the training programme based on advanced university studies are delivered by experienced teaching staff who have been awarded the Doctoral supervisor/habilitation title. The academic subjects in the field of Systems Engineering in the current curriculum run as follows:

1. *Robust Control Systems*
2. *System Modelling and Identification*
3. *Adaptive Control Systems*
4. *Digital Control Systems*
5. *Embedded Control Systems*
6. *Predictive Control Systems*
7. *Industrial Networks*
8. *Intelligent Control Systems*
9. *Methodology of Scientific Research*
10. *Ethics and Academic Integrity*

The curriculum also contains 4 scientific research reports (R0-R3) that are submitted by the Doctoral students, as well as a plan for the dissemination of the scientific research outcomes of the Doctoral student through the publication of scientific papers in peer-reviewed journals and proceedings of international conferences (ISI - Clarivate Analytics, the IDB - international databases, ISI and IDB indexed volumes). The curriculum provides for the drafting, evaluation and defence of the doctoral thesis in front of the Advisory committee and the public defence in front of the Thesis defence committee.

180 ECTS credit points are allocated in the curriculum, 60 credits per academic year in the three-year programme in the Doctoral field of Systems Engineering (Annex_A.3.1.3_1).

1.2.3. PhD Supervisors

In the Doctoral field of **Systems Engineering**, the following Doctoral supervisors are active:

- Professor Eng. Dan POPESCU, supervisor since 2008 (order no. 3292/26.02.2008)
- Professor Eng. Dan SELIȘTEANU – habilitated in 2016 (no. 4010/07.06.2016)
- Professor Eng. Monica ROMAN – habilitated in 2019 (no. 3821/01.04.2019)
- Professor Eng. Dorin ŞENDRESCU – habilitated in 2019 (no. 3822/01.04.2019)
- Professor Eng. Daniela DANCIU – habilitated in 2019 (no. 4105/28.05.2019)

All 5 Doctoral supervisors are full-time teaching staff of the University of Craiova and meet all the standards and quality criteria (described in extenso in Section 2).

1.2.4. Dynamics of Doctoral students and doctoral degrees in the last 5 years

In the last 5 years, 11 Doctoral students have enrolled to the doctoral programme in the field of Systems Engineering, and 5 enrolled in the academic year 2020-2021. Of the 11 Doctoral students, 2 have defended their doctoral theses (validated by the CNATDCU and the Order of the Minister), and **14 are in progress** (one student undertakes extension). Of the 7 Doctoral students enrolled before 2015, 5 completed their theses and 2 dropped out in the period 2015-2020, **7 graduates from the Doctoral field of Systems Engineering** (including 2 female Doctoral students and 5 male Doctoral students) defended their doctoral theses (validated by CNATDCU and the Order of Minister) – Table 1.2 (details in Section B3).

Figure 1.1 illustrates the evolution of the number of PhD students enrolled in the Doctoral field of Systems Engineering per academic year (2015-2021) – See also **Annex 1.2.4**. Figure 1.2 indicates the statistics of the Doctoral students enrolled in the first year in the IS field by academic year.

Table 1.2. Doctoral degrees in Systems Engineering (2015-2020)

No.	Graduate's name	Year	Number of Minister Order awarding the title	Doctoral supervisor
1	MONEA Bogdan-Florian	2020	3461/08.03.2021	PETRE Emil
2	POPA Bogdan	2019	5748/13.10.2020	POPESCU Dan
3	LORINCZ Alexandra-Elizabeth	2019	5748/13.10.2020	SELIȘTEANU Dan
4	NGUYEN Van Dong Hai	2018	5474/14.11.2018	IVĂNESCU Mircea
5	ȘOIMU Andreea Valentina	2016	3769/20.04.2017	RĂSVAN Vladimir
6	MATEI Lucian	2016	3769/20.04.2017	VÎNĂTORU Matei
7	DICU Gheorghe Doru	2015	5954/07.12.2015	VÎNĂTORU Matei

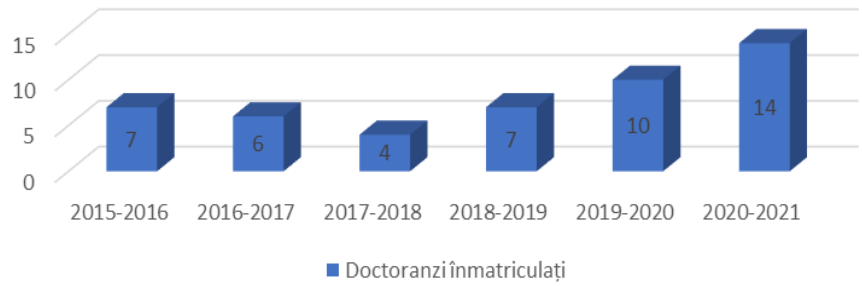

Figure 1.1. The evolution of the number of Doctoral students enrolled (in all years of study) in the SE doctoral field by academic year (2015-2021)

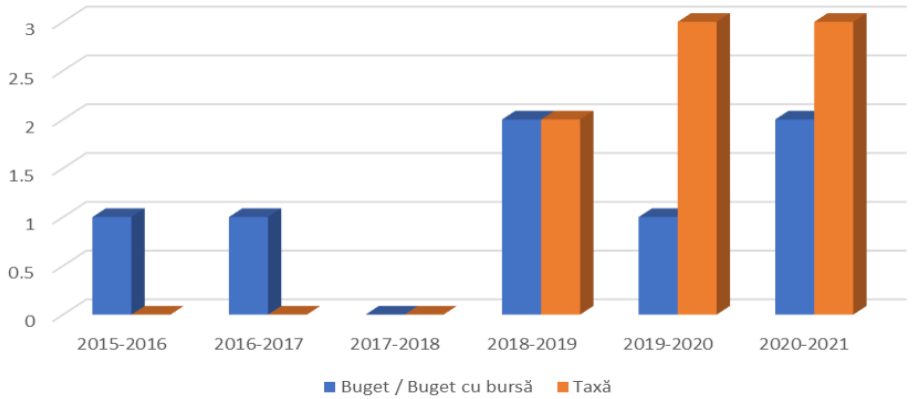

Figure 1.2. Programme type of the Doctoral students enrolled in the first year in the SE doctoral field per academic year

1.2.5. Scientific research centres/laboratories

The Research Laboratory of Nonlinear Automation and Intelligent Systems (ANSI) was organized within the Department of Automation and Electronics (DAE), the Faculty of Automation, Computers and Electronics. **Annex 1.2.5** describes the ANSI laboratory, its status and research approaches, its members, infrastructure, scientific achievements, certificates. The ANSI laboratory is organized within the framework of the Nonlinear Automation, Stability and Oscillations Research Centre (ANSO)*, established in 2001.* This Centre was accredited and recognized by CNCSIS in 2001 (Certificate no.19/CC-B of 11.05.2001) and re-accredited in 2006 (Certificate no.10/12.09.2006) - **Annex 1.2.5**. Also, the ANSO Centre was accredited and re-accredited within the University of Craiova (2013-2015).

The Research Laboratory of Nonlinear Automation and Intelligent Systems (ANSI) falls within the main field of **Systems Engineering**, ***hence the doctoral field subject to evaluation***. The ANSI Laboratory is an integral part of the Research Centre at the Faculty of Automation, Computers and Electronics: ***Interdisciplinary Centre for Research in Computers, Automation and Robotics (CERCA)***, undergoing institutional evaluation (March-May 2021).

The ANSI Research Laboratory team counts 21 members, of which 6 are Doctoral supervisors: the 5 Doctoral supervisors in Systems Engineering and the laboratory head - Professor Vladimir Răsvan, member of the Romanian Academy of Technical Sciences, Professor Emeritus of the University of Craiova and founder of the "Constantin Belea" Doctoral School. The team of the ANSI Research Laboratory also includes three teaching staff members, members of the Doctoral School of Systems Engineering (teaching and research staff) that are not Doctoral supervisors: Professor Eng. Cosmin Ionete, PhD, Associate Professor Eng. Dorina Purcaru, PhD Ion Marian Popescu. Also, 3 Doctoral students in the Doctoral field of Systems Engineering are members of the ANSI team – **Annex 1.2.5**.

All Doctoral students in the Doctoral field of Systems Engineering have access to the scientific research laboratories and the infrastructure of the Faculty of Automation, Computers and Electronics, as indicated in Section 2 (Subsection A2 - Research infrastructure, including related annexes) of the present Self-evaluation Report. The Doctoral field of Systems Engineering also benefits from the research laboratories within the Research Hub of Applied Sciences – INCESA (See also Section A2 of the Self-Evaluation Report). The laboratories, equipment and research services related to INCESA are presented on the EERIS platform: https://erris.gov.ro/.

In order to access the resources related to the teaching and research activities, the members of the Doctoral School (teaching staff and Doctoral students) use the libraries of the University of Craiova and of the Faculty of Automation, Computers and Electronics. All libraries provide both a wide range of scientific books and collections of journals (IEEE, IFAC, Springer, Elsevier, etc.) and secure mobile access via ANELIS Plus (see detailed description in section A2 of the present Report).

Most Doctoral supervisors of SDCB (all those in the field of SE), as well as Doctoral students of SDCB are affiliated with SRAIT - Romanian Society of Automation and Technical Informatics, IFAC-NMO (http://www.automation.ucv.ro/srait/index.htm).

1.2.6. Main scientific achievements

In what follows some of the relevant scientific achievements of the Doctoral School in the field of Systems Engineering are featured (some of them are fully described in the annexes to Section 2 of the present Report).

Representative projects and grants

1. *Research and knowledge transfer in the area of software technologies and tools for industrial processes - TISIPRO,* POC, ID/my SMIS code: P_40_416 / 105736, no. 61/05. 09.2016, Director: Dan Popescu, 2016-2021, 6,178,388 lei.

2. *Brain-inspired technologies for intelligent navigation and mobility – INAVIGATE*, EU research grant H2020-EU.1.3.3-MSCA-RISE-2019, Project No. 873178/07. 11.2019, Director: Daniela Danciu, 2019-2021, 93,609 lei.

3. *Modelling, simulation and advanced control of Biosystems - MOSCBIOS*, PNCDI III, No. contract 25/2018, no. UCv: 5c / 2018, Director: Monica Roman, 2018-2020, 450,000 lei.

4. *Advanced management systems of bioprocesses in the food industry - ADCOSBIO,* PNCDI II, PCCA, 211/2014, Director: Dan Selișteanu, 2014-2017, 450,000 lei.

The members activating in the Systems Engineering Doctoral field have managed **over 10 research projects in the last 5 years, with a total budget of over 7,000,000 lei**. It is worth mentioning that that within the ongoing TISIPRO project, subsidiary research contracts were signed with 5 business partners (RELOC SA, Computing Centre of Tg. Jiu, Oltenia Water Company SA, VONREP SRL, SC INDAELTRAC SRL), ensuring the development and implementation of control systems and software algorithms in the field of Systems Engineering:

- advanced monitoring and control system for railway vehicles;
- security software tools for distributed control systems;
- software solutions for the control of energy-efficient multilevel converters;
- predictive maintenance algorithms for mechanical structures;
- analysis, modelling and monitoring of processes in wastewater treatment plants.

Representative publications

Out of the papers published in journals and proceedings of international conferences and the scientific books listed in the annexes related to Section A3 (Human Resource Quality) of the Report, we mention some **high-impact articles,** published in **ISI WoS - Clarivate Analytics indexed journals (in quartiles Q1 / Q2)** by current and former members of the Doctoral School, some of them based on international cooperation:

1. Danciu, D., V. Răsvan, Controlling co-generation: conservation laws, modelling and Lyapunov synthesis. *International Journal of Control,* Taylor and Francis, 93:336–345, 2020, WOS:000513185600017 [Q2, Impact Factor IF=2.780]
2. Petre, E., D. Selişteanu, M. Roman, Control schemes for a complex biorefinery plant for bioenergy and biobased products. *Bioresource Technology*, Elsevier, 295, Art. 122245, 2020, ISSN 0960-8524. WOS: 000499718900019 [Q1, IF 7.539]
3. Marin, C., D. Popescu, E. Petre, D. Selișteanu, Modeling and control of the orthogonalization plants in textile industry. *IEEE Trans. on Industry Applications*, 55(4):4247–4257, 2019, ISSN 0093-9994. WOS: 000474562900089 [Q1, IF 3.488]
4. Răsvan, V., D. Danciu, D., Popescu, On absolute (robust) stability: slope restrictions and stability multipliers. *International Journal of Robust and Nonlinear Control*, Wiley, 23:77–103, 2013, ISSN: 1049-8923. WOS:000343950800004 [Q1, IF 3.503]

5. Tan, J., S. Olaru, M. Roman, F. Xu, B. Liang, Invariant Set-based analysis of minimal detectable fault for discrete-time LPV systems with bounded uncertainties. *IEEE Access*, 7:152564–152575, 2019, ISSN: 2169-3536. WOS: 000497163000175 [Q1, IF 3.745]
6. Danciu, D., V. Răsvan, D. Popescu, Control of a time delay system arising from linearized conservation laws, *IEEE Access*, 7(1):48524–48542, 2019, ISSN: 2169-3536. WOS: 000466706400001 [Q1, IF 3.745]
7. Roman, M., D. Selişteanu, Modeling of fast reaction mechanisms for biomass conversion processes. *Combustion Science and Technology*, Taylor and Francis, 188:290–305, 2016, ISSN 0010-2202. WOS: 000375478600009 [Q2, IF 1.730]
8. Selişteanu, D., S. Tebbani, M. Roman, E. Petre, V. Georgeanu. Microbial production of enzymes: Nonlinear state and kinetic reaction rates estimation. *Biochemical Eng. Journal*, Elsevier, 91:23–36, 2014, WOS:000299110800008 [Q2, IF 3.475]
9. Petre, E., D. Selişteanu, D., Şendrescu. Adaptive and robust-adaptive control strategies for anaerobic wastewater treatment bioprocesses. *Chemical Eng. Journal*, Elsevier, 217:363–378, 2013, WOS:000316835600042 [Q1, IF 10.652]
10. Selisteanu, D., E. Petre, M. Roman, D. Şendrescu. Estimation of kinetic rates in a baker's yeast fed-batch bioprocess by using nonlinear observers. *IET Control Theory & Applications*, 6(2):243–253, 2012, WOS:000299110800008 [Q1, IF 3.343]

Some of the chapters recently published **in prestigious international publishing houses** (Elsevier, Springer, etc.):

1. Petre, E., D. Selişteanu. *Advanced Estimation and Control Schemes for Biorefinery Plants*. In: Waste Biorefinery-Value Addition through Resource Utilization (T. Bhaskar, S. Varjani, A. Pandey, E. R. Rene Eds.), Chapter 1, pp. 1-41, *Elsevier*, ISBN 978-0-12-821879-2, 2021.
2. Selisteanu, D., E. Petre, I. M. Popescu, M. Roman. *Advanced Control Algorithms and Software Solutions for Monitoring and Data Acquisition in a Wastewater Treatment Plant*. In: Advances in Environmental Research, Vol. 76 (Justin A. Daniels Ed.), Chapter 3, pp. 125-161, *Nova Science Publ.*, Inc., NY, USA, ISBN 978-1-53618-690-1, 2020.
3. Răsvan, V., D. Danciu, D., Popescu. *Some Neutral Functional Differential Equations Occurring in Synchronization*. In: Delays and Interconnections: Methodology, Algorithms and Applications (G. Valmorbida *et al.* Eds.), Series: Advances in Delays and Dynamics 10, Chapter 2, pp. 19-32, *Springer*, ISBN 978-3-030-11554-8, 2019.
4. Răsvan, V. *Huygens Synchronization over Distributed Media – Structure versus Complex Behavior*. In: Structural Methodology in the Study of Complex Systems (E. Zattoni *et al.* Eds.), LNCIS 482, Chapter 8, pp. 243-274, *Springer*, ISBN 978-3-030-18571-8, 2019.
5. Şendrescu, D., S. Tebbani, D. Selişteanu. *Bioprocesses Parameter Estimation by Heuristic Optimization Techniques*. In: Developments in Model-Based Optimization and Control (S. Olaru *et al.* Eds.), LNCIS 464, Ch. 11, pp. 237-254, *Springer*, ISBN 978-3-319-26685-5, 2015.

Publications of Doctoral students

In the last 5 years, 7 graduates have completed their PhD theses in Systems Engineering, currently being employed as teaching staff members, researchers within various research institutes or in the R&D departments of field-related companies. Among their relevant published contributions (as indicated in Section B3 of the Self-evaluation Report) we mention:

1. **Monea, B.F.,** E.I. Ionete, S.I. Spiridon, Experimental investigation and CFD modeling of slush cryogen flow measurement using circular shape capacitors. *Sensors*, 20(7), 2117, 2020. [ISI, Q1]
2. **Lörincz, A.E.,** S. Cucaila, Propagation of radio signals in V2V/V2I communications. *Journal of Electrical and Electronics Engineering*, 12(1):27–32, 2019. [Scopus]
3. **Popa, B.,** M. Roman, **R.L. Constantinescu**, Fast Fourier processing and real-time transformation system for a dynamic vibration signal. *Proc. 20th Int. Carpathian Control Conference ICCC*, Poland, 2019. [ISI Proc., IEEEXplore]
4. **Nguyen, V.D.H.,** X.D. Huynh, M. T. Nguyen, C. Vladu, M. Ivănescu, Hierarchical sliding mode algorithm for athlete robot walking. *Journal of Robotics*, ID 6348980, 2017. [ISI]
5. Florescu, M., **V.D.H. Nguyen**, M. Ivănescu, Output track controller with gravitational compensation for a class of hyper-redundant robot arms. *Studies in Informatics and Control*, 24(3):309–316, 2015. [ISI, Q2]

Scientific events organized (selection, last 5 years)

Within the Doctoral School and the Faculty of Automation, Computers and Electronics prestigious scientific events have been organised, co-sponsored by high standing international societies in the field (IEEE Control Systems Society, IFAC etc.), among which we mention the most important of the last 5 years:

- *International Conference on System Theory, Control and Computing – ICSTCC* (editions 2016, 2017, 2018, 2019, 2020) [ISI Proc. / IEEEXplore]
- *International Carpathian Control Conference – ICCC* (editions 2016, 2017, 2018, 2019, 2020) [ISI Proc. / IEEEXplore]
- *IFAC Symposium on System Structure and Control SSSC 2019* [ISI Proc. / IFAC-PapersOnLine]
- *IFAC Workshop on Time Delay Systems TDS 2019* [ISI Proc. / IFAC-PapersOnLine]

1.3. The Functioning of the Internal Quality Assurance System

The functioning of the quality assurance system within the IOSUD - University of Craiova is ensured through specific procedures at the level of all the involved structures (IOSUD, Doctoral Schools, Doctoral Fields). These procedures are applied in accordance with the *Rector's Statement on the Quality Assurance Policy of the University of Craiova* (**Annex_1.3.1**). The objectives pursued by the University of Craiova in the field of quality management are enclosed in *the Quality Assurance Code of the University of Craiova* (**Annex_1.3.2**). The quality assurance system of the IOSUD and Doctoral Schools is integrated to the quality management structure of the University of Craiova. The overarching authority in this system is represented by the *Senate of the University of Craiova.* The operative management of the University of Craiova is provided by the *Administrative Board*, made up by the Rector, Vice-Rectors, the Director of the Council of Doctoral Studies, Deans, the General Administrative Director, and a student representative.

The Department of Quality Management (DMC) operates at the University of Craiova, The DMC mission is established by the University of Craiova Charter, Art. 162, and the objectives are specified in Art. 163 (**Annex_1.2.1_1**). Details of the specific quality assurance activities and practices of the DMC are set out in the DMC Regulation (**Annex_1.3.3**), the DQA Strategic Plan for the period 2020-2024 (**Annex_1.3.4**), the DMC Operational Plan for 2020 (**Annex_1.3.5**), and the Quality Assurance Code (**Annex_1.3.2**). The *Evaluation and Quality Assurance Commission* (CEAC) operates under the DMC (**Annex_1.3.6**). The activity carried out by the DMC is monitored by the Committee for Quality Assurance, Academic Evaluation and Accreditation, under the Senate, which reports according to the instructions of ARACIS (external evaluator).

Quality assurance and evaluation policies and means of achievement in the field of education are developed and implemented by the DQA, 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 *University Code of Ethics* operates at the university level (**Annex_1.3.7**), compliance with the University Code of Ethics is ensured through all mechanisms, including the *Ethics Committee of the University of Craiova* (**Annex_1.3.8**).

The management structures at the level of the "Constantin Belea" Doctoral School (SDCB) undertake quality assurance system functionality, including at the level of the Doctoral Field. Thus, the system of internal quality assurance in the Doctoral field of Systems Engineering is compliant with the quality assurance system provided in the *Regulation on operation, and internal quality assurance at the level of the "Constantin Belea" Doctoral School* (**Annex A.1.1.1 2**), as well as the *Methodology for the evaluation of doctoral programmes of the IOSUD, University of Craiova* (**Annex C.1.1.1 1**).

The director of the SDCB regularly drafts self-evaluation reports of the Doctoral School (**Annex 1.1.5**) that are submitted to the Council of the Doctoral School, subject to the approval of the SDCB Council. The efficiency of internal quality assurance procedures and structures and their impact on doctoral activities are evaluated (Art. 15, SDCB Regulation – **Annex A.1.1.1 2**). The conclusions of the self-evaluation reports are analysed in the Council of the Doctoral School in order to identify problems and solutions to continuously improve the quality of the doctoral programmes at the SDCB level.

The internal quality assurance and monitoring policy of the "Constantin Belea" Doctoral School is transparent, in accordance with the regulation on clear and quantifiable criteria to be fulfilled by Doctoral supervisors, Doctoral students and research performance.

The general objectives of the Internal Quality Assurance System for the doctoral programmes are specified in the Regulation of the "Constantin Belea" Doctoral School and are structured on three main directions aimed at:

- quality and efficiency of the educational process within the Doctoral Field,
- quality and efficiency of the research activity carried out by the Doctoral students,
- quality of the research outcomes achieved by PhD supervisors and PhD students.

The quality of the educational activities within the field of doctoral studies is ensured by the periodic evaluation of the quality and structure of the doctoral programmes in the curriculum (**Annex A.3.1.3 1**, http://ace.ucv.ro/sdcb/educatie.html), according to Art. 7 and Art. 9 of the Regulation of the "Constantin Belea" Doctoral School (**Annex A.1.1.1 2**).

The periodic evaluation of the PhD supervisors within the SDCB is carried out according to the procedure and criteria provided in the SDCB Regulation, Art. 3, paragraphs (3) to (6).

The research performance of Doctoral students is periodically evaluated according to the criteria of the SDCB Regulation Art. 4, Art. 7, Art. 8, and Art. 9. The quality of the research outcomes achieved by the Doctoral students is periodically evaluated according to Art. 9 paragraphs (1), (4), (5), (6), Art. 10 and Art. 11 of the SDCB Regulation.

The beneficiaries of the quality assurance policies are Doctoral students as well as Doctoral supervisors and teaching staff members of the Doctoral School.

The Regulation of the "Constantin Belea" Doctoral School is closely related to the *quality assurance and management system at the university level*, according to Art. 1 paragraphs (3) and (4).

Prominent members of the IOSUD University of Craiova, academics from the country or abroad and Doctoral students may attend the meetings of the SDCB Council without having the right to vote.

The procedures and systems implemented ensure transparency and facilitate access to information specific to the Internal Quality Assurance System for internal and external beneficiaries (see also *full description* in Section C of this report).

2. Fulfilment of criteria, standards and performance indicators

This section frames the extent to which the criteria, standards and performance indicators set out in Annex no. 2 of the Order of the Minister of Education no. 3651 of April 20, 2021, accompanied by supporting evidence in electronic format, as Quality Assurance Measures at the level of the Systems Engineering Doctoral Field.

A. Institutional capacity

A.1. Institutional, administrative, management structures and financial resources

A.1.1. The institution organizing doctoral studies (IOSUD) has implemented the effective functioning mechanisms provided in the specific legislation on the organisation of doctoral studies

A.1.1.1. The existence of specific regulations and their application at the level of the Doctoral School to which doctoral field is integrated (last 5 years)

A series of regulations and methodologies for the organisation and conduct of the doctoral activity have been applied in the last 5 years at the level of IOSUD and of the "Constantin Belea" Doctoral School. *The Institutional Regulation on the organisation and functioning of the doctoral study programmes of the organizing institution of Doctoral Studies - University of Craiova*, in force, was adopted by the decision of the University Senate no. 12/24. 11.2016, with the amendments and completions of the Senate decisions of 12.07.2019, 26.09.2019 and 28.01.2021 (**Annex_A.1.1.1_1** - IOSUD Regulation). The regulations and methodologies for organising and conducting doctoral activities underpin several directions:

a) The IOSUD Institutional Regulation on the organisation and conduct of the doctoral studies **Annex_A.1.1.1_1**), and the Regulation on the organisation, operation, and internal quality assurance at the level of the "Constantin Belea" Doctoral School, Faculty of Automation, Computers and Electronics, University of Craiova – **Annex_A.1.1.1_2**,

http://ace.ucv.ro/sdcb/files/regulament_SDCB.pdf .

b) The Methodology for conducting elections for the position of Director of the Doctoral School Council (CSD), as well as the election of SCD members and of the PhD students' representative in the CSD (CSUD Appointment Methodology and CSUD Decision: **Annex_A.1.1.1_3**, CSD Elections Methodology: **Annex_A.1.1.1_4**).

The last CSD elections for the "Constantin Belea" Doctoral School were held in 2020 (Minutes of the election process – **Annex_A.1.1.1_5**).

c) Methodologies for the organisation and conduct of doctoral studies: admission of PhD candidates, completion of doctoral studies (Regulation on the organisation and conduct of the competition for admission to Bachelor's, Master's and doctoral programmes at the IOSUD level – **Annex_A.1.1.1_6**, Evaluation criteria for admission to doctoral studies within the SDCB – **Annex_A.1.1.1_7**, IOSUD Regulation - completion of studies, Chapter VI, **Annex_A.1.1.1_1**).

d) The IOSUD has implemented mechanisms for the recognition of the position of doctoral supervisor and for the equivalence of the PhD title conferred in other states (**Annex_A.1.1.1_8**).

e) The "Constantin Belea" Doctoral School has developed and implemented functional management structures to coordinate the doctoral activity at each level. Thus, the Council of the Doctoral School was established and operates (http://ace.ucv.ro/sdcb/organizare.html), based on regular meetings.

The Council of the "Constantin Belea" Doctoral School consists of 3 Doctoral supervisors from the University of Craiova, an external member, and a PhD student (the structure of the CSD was presented in Section 1.1 of the present Report). Regular meetings of the Council of the "Constantin Belea" Doctoral School (SDCB) are convened, as well as meetings of all the PhD supervisors of the SDCB (examples of CSD meeting minutes – **Annex_A.1.1.1_9**).

f) The IOSUD - University of Craiova concludes study contracts with all students admitted to the doctoral programmes both for the budgeted places and in the tuition-based system (models of contract – **Annex_A.1.1.1_10**).

g) The "Constantin Belea" Doctoral School applies internal procedures for the analysis and approval of topic proposals for the doctoral programme based on advanced university studies (**Annex_A.1.1.1_11**).

A.1.1.2. The Regulation of the Doctoral School includes mandatory criteria, procedures and standards for the items specified in art. 17 par. (5) of the Code of Doctoral Programmes, approved by Government Decision No. 681/2011, with subsequent amendments and completions

The criteria, procedures and mandatory standards on the Code of Doctoral Programmes (*IOSUD Regulation* - **Annex_A.1.1.1_1**) are in accordance with the G.D. no. 681/2011, art. 17 par. (5), with subsequent amendments and completions by Government Decision No. 134/02.03.2016. *The Regulation of the "Constantin Belea" Doctoral School* (**Annex_A.1.1.1_2**) establishes mandatory criteria, procedures and standards for the following aspects:

a) affiliation of new Doctoral supervisors, as well as regulations on the withdrawal of a Doctoral supervisor from the Doctoral School: Article 3 of the Regulation of the "Constantin Belea" Doctoral School;

b) decision-making mechanisms regarding the opportunity, structure and content of the doctoral programme based on advanced university studies: Article 7 of the Regulation of the "Constantin Belea" Doctoral School;

c) procedures for the replacement of a Doctoral supervisor of a Doctoral student and conflict mediation procedures: Article 8 of the IOSUD Regulation and Article 12 of the "Constantin Belea" Doctoral School Regulation (SDCB);

d) the conditions under which the doctoral programme may be discontinued: Article 32 of the IOSUD Regulation and Article 13 of the SDCB Regulation;

e) measures to prevent possible fraud in the academic and research activities, including plagiarism: Article 11 of the SDCB Regulation (art. 12 of the IOSUD Regulation);

f) ensuring access to research resources: Article 6 of the "Constantin Belea" Doctoral School Regulation and the IOSUD - UCv Regulation;

g) attendance obligations of the Doctoral students: provisions laid down in the study contracts and in Articles 7, 8 and 9 of the "Constantin Belea" Doctoral School Regulation.

A.1.2. IOSUD has the necessary logistics to fulfil the Mission of the doctoral studies

A.1.2.1. The existence and effectiveness of an adequate software for the record of doctoral students and their academic achievements

The Information System ***EvStud*** (Student Records of the University of Craiova) is implemented at the IOSUD http://cis01.central.ucv.ro/evstud/, recording and processing the data of students from all cycles of education, Bachelor's and Master's programmes, doctoral and postgraduate studies (academic record and track record). Each PhD student has an electronic page that records all the steps taken: exam results, reports, research activity assessment and participation in national and international scientific events, as well as the publication of some specialized research papers.

For example, **Annex A.1.2.1** describes the Information System *EvStud* (Student Records of the University of Craiova), the Rules of the network use, Administration and Management Procedures of the e-transcript of records, the Information System at the level of the Faculty of Automation, Computers and Electronics, a transcript of records template, as well as a printscreen of the web page for a Doctoral student in the field of Systems Engineering.

Following enrolment, any change in the status of the Doctoral student is recorded in the Information System. The IOSUD Secretary Office uploads in *EvStud* data on exams and research reports, interruptions, extensions, transfers from one supervisor to another, payment of fees, the thesis defence, etc.; the system is complex and effective.

Access and processing of information in the database are performed only by the authorized staff. Through an account and password generated by the Information System, the access of each Doctoral student is secured to visualise their academic performance and other information of interest.

A.1.2.2. The existence and use of a software to check the similarity index of all doctoral theses, and supporting evidence of its use

The University of Craiova and IOSUD ensures the verification of the authenticity and originality of doctoral theses and other works via www.sistemantiplagiat.ro software, listed and recognized by the National Council for Attesting the University Titles, Diplomas and Certificates (CNATDCU), according to the provisions of art. 2 of the MEN Order No. 3485 of 4.04.2016. For the software use, the University of Craiova subscribes annually, on a fee-based contract.

Annex A.1.2.2 shows the software purchase certificate, the description and the user manual of the anti-plagiarism system. Also, a report of similarities for a doctoral thesis in Systems Engineering is enclosed.

The procedure applied for the authenticity verification of a doctoral thesis via www.sistemantiplagiat.ro is described in the IOSUD Regulation (**Annex A.1.1.1 1**), the articles on the stages of completion of doctoral studies (respectively, art. 39, stages 1 and 2). According to these stages, after the analysis of the thesis by the system, the Doctoral supervisor and the Advisory committee analyse the thesis and the similarity index report. Then, the PhD supervisor completes a resolution following the interpretation of the values of the similarities coefficients (two main coefficients are considered) and validates or invalidates

the originality of the thesis. If the resolution of the Doctoral supervisor is negative (inadequate similarity index report or inadequate thesis quality), the Doctoral candidate is recommended to revise the thesis and resubmit it to obtain the consent for the public defence of the revised thesis, for which it is mandatory to obtain, upon request, a new similarity index report.

A.1.3. IOSUD ensures that the financial resources are used optimally, and that the income from doctoral programmes is supplemented by funding additional to that provided by the Government

A.1.3.1. The existence of at least one on-going research grant or institutional/human resources development grant per field of doctoral programmes at the time of submission of the self-evaluation report for the Systems Engineering Doctoral Field

Criterion: The A.1.3.1 Criterion requires the existence of at least one on-going research grant or institutional/human resources development grant per field of doctoral programmes at the time of submission of the self-evaluation report for the Systems Engineering Doctoral Field, or the existence of at least 2 research grants or institutional/human resources development grants per field of doctoral programmes obtained by the doctoral supervisors in the evaluated field in the last 5 years.

The 5 Doctoral supervisors of the Doctoral School of Systems Engineering are involved in research activities, both basic and applied. All PhD supervisors are part of the grants' teams obtained through competition and have managed to attract additional funding to support the research activity of the PhD students. The type of grants, their value, as well as the funding body are mentioned in the CVs of Doctoral supervisors and in the CNATDCU assessment grid of fulfilment of the minimal standards (annexes to Section A3 - Quality of Human Resources), and in the table presented in **Annex A.1.3.1** (over 10 contracts, of over 18,000,000 lei between 2015-2020). To demonstrate the fulfilment of the criterion of at least two research grants, we mention the following examples of grants carried out in the last 5 years in the field of Systems Engineering, coordinated by PhD supervisors as directors / managers (see also **Annex A.1.3.1**, more than 5 contracts, with a budget of over 7,000,000 lei):

1. *Systems with Propagation: New Approaches in Control Design for Oscillations Quenching – ProCO*, PNCDI III, Romania-France bilateral cooperation, code: PN-III-P3-3.1-PM-RO-FR-2016-0055, 78 BM/2017, no. UEFISCDI: PN3-P3-229/2017, no. UCv 7C / 2017, Partner: Laboratoire des Signaux et Systèmes, CentraleSupelec - Université Paris Sud, France, budget 22,356 lei, between 2017-2018. Director: Daniela DANCIU
2. *Advanced food bioprocess management systems (ADCOSBIO)*, PN-II-PT-PCCA-2013-4-0544, PNCDI II, PCCA partnerships, contract no. 211/2014, coordinator University of Craiova, no. UCv 66C / 2014, partners: SC Moara Calafatului SRL, Politehnica University Timișoara, "Lower Danube" University of Galați, budget UCv 450,000 lei, between 2014 - 2017. Director: Dan SELIȘTEANU
3. *Advanced biosystem modelling, simulation and control (MOSCBIOS),* PNCDI III, Research projects to stimulate young independent teams, PN-III-P1-1.1-TE-2016-0862, no. 25/ 2018, no. UCv 5C/27.04.2018, no. UEFISCDI 1004/04. 05.2018, budget 450,000 lei, between 2018 - 2020. Director: Monica ROMAN

4. *Research and knowledge transfer in the area of software technologies and tools for industrial processes (TISIPRO),* Competitiveness Operational Programme, 1.2.3 Knowledge transfer Partnerships, ID/ my SMIS code: P_40_416/105736, no. 61/05. 09.2016, 5 subsidiary contracts Type D, total budget 6,178,388 lei, between 2016 - 2021. Director: Dan POPESCU

Of these projects, ***the TISIPRO project is ongoing.*** The grants address relevant topics to the field of Systems Engineering, some of them have involved PhD students in the research activity (for example, the ProCO project, Bogdan Popa - PhD student, 2017-2018; the MOSCBIOS project, Bogdan Popa and Radu Lucian Constantinescu, between 2018 - 2020; the CCF - SURF Project, Mădălin Lucian Mămuleanu, between 2020 - 2021).

Between 2014 and 2015, a human resources development project was carried out: *University Scholarships in Romania through European Support for Doctoral and Post-PhD students (DOC-POSTDOC Scholarships)*, no. POSDRU/159/1.5/S/133255, coordinator the University of Craiova, partners: "Lucian Blaga" University of Sibiu, West University of Timișoara and University of Bucharest, project manager (Professor Dan Popescu) and the manager of the post-doctoral programme (Professor Dan Selișteanu) both Doctoral supervisors in the field of SE. Also, a POCU project is ongoing, i.e., *The Entrepreneurial University - Higher Education and Training System for the Romanian labour market by granting scholarships for PhD students and postdoctoral researchers and implementing innovative entrepreneurial training programmes,* POCU/380/6/13/123990, 2019-2022 (See also the next subsection), in which some of the SDCB PhD supervisors are involved (Professor Dan Selișteanu, etc.) as experts, and the PhD students in the field of Systems Engineering are amongst beneficiaries.

*A.1.3.2. Doctoral students that benefited for a minimum of 6 months from sources of funding other than governmental funding

Criterion: The percentage of the PhD students who at the time of the evaluation benefit from at least six-month funding other than the government subsidy, through scholarships awarded by natural or legal persons or who are financially supported via research or institutional/human resources development grants, is not below 20%.

In the grants presented in **Annex A.1.3.1**, **two of the 14 existing Doctoral students at the Doctoral School of Systems Engineering were included in the research team and benefited from sources of funding for periods of more than 6 months**: Radu-Lucian Constantinescu (the MOSCBIOS project) and Mădălin Mămuleanu (the CCF_SURF project). Bogdan Popa, a Doctoral student who completed his thesis in 2019 (the MEC order of 2020) benefited from sources of funding in the MOSCBIOS and TIAVIB projects.

Also, the PhD students who were awarded private QForIT grants benefited from sources of funding other than governmental funding: Bogdan Popa (12 months in 2017, 2018), Teodor-Constantin Nichițelea (10 months in 2018, 2019), Maria Geanina Unguritu (10 months in 2018, 2019), Claudiu Nicola (10 months in 2018, 2019), Mădălin Lucian Mămuleanu (5 months in 2019, 2020), George Bujgoi (5 months ago in 2019, 2020), Codrin Tiberiu Mustățea (5 months in 2019, 2020) and Mihai Bebe Simion (5 months in 2019, 2020) – see **Annex A.1.3.2 1** (QForIT grants). Consequently, of the existing Doctoral students in the field of Systems Engineering, **three Doctoral students have benefited from QforIT grants** for a period of more than 6 months (Teodor-Constantin Nichitelea, Maria-Geanina Unguritu, Claudiu Nicola).

Also, a POCU project has been implemented: OS 6.13 - Support for PhD students, post-doctoral researchers, i.e., "The Entrepreneurial University - Higher Education and Training System for the Romanian labour market by granting scholarships for PhD students and postdoctoral researchers and implementing innovative entrepreneurial training programmes", POCU/380/6/13/ 123990, period 2019-2022, budget 6,173,828.15 lei (**Annex A.1.3.2 2**). This programme includes **three Doctoral students** from the evaluated field: Gheorghe Bujgoi, Codrin Tiberiu Mustățea and Mădălin Lucian Mămuleanu.

In accordance with the above-mentioned data, we highlight that **7 of the 14 Doctoral students** benefited from sources of funding other than governmental funding (for more than 6 months), **thus a percentage of 50%.**

*A.1.3.3. Use of doctoral grants and tuition to reimburse the training costs of doctoral students

Criterion: At least 10% of the total amount related to doctoral grants obtained by the university based on the institutional contract and on the tuition fees collected from the full-fee paying PhD students are used to reimburse the training costs of doctoral students (attendance of conferences, summer courses, training courses, internships abroad, publication of research papers or other specific forms of dissemination, etc.).

At the University of Craiova, the accounting statement of income and training costs is carried out at the level of Doctoral Schools, rather than at the level of doctoral fields. Accordingly, the situation at the level of the "Constantin Belea" Doctoral School is presented below. **Annex A.1.3.3 1a** displays the income and training costs for the period 2016-2020, and **Annex A.1.3.3 1b** shows the SDCB detailed training costs for the period 2016-2020. According to the above-mentioned documents, it results the ratio Doctoral School income / training costs for doctoral students (attendance of conferences, summer courses, training courses, internships abroad, publication of research papers or other specific forms of dissemination, etc.) for the SDCB, as summarised in the table below – Table A.1.1.

It should be noted that the SDCB funds were allocated to all the three fields of doctoral studies, therefore including the training of doctoral students in the field of Systems Engineering, by paying the expenses for the attendance of conferences (for example, *the Int. Conf. on Methods and Models in Automation and Robotics MMAR 2019* – travel expenses for Teodor-Constantin Nichițelea and Maria-Geanina Unguritu, 9,123 lei) and at summer schools, such as, *the Int. Graduate School on Control IGSC* (module M22-Predictive and Optimization Based Control for Automotive and Aerospace Applications), France, 2019, Teodor-Constantin Nichițelea and Maria-Geanina Unguritu (13,125 lei).

Table A.1.1. Statement of income/training costs at the SDCB level (2016-2020)

Year	SDCB income (lei)	SDCB training costs for doctoral students (lei)	Percentage
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%
Total	994,167	2,543	3.28%

The policy of the University of Craiova underpins financial support for PhD students professional training from various sources: the funds of doctoral schools, the research fund, research projects. As such, the University of Craiova has set up a special fund, additional from the resources generated by doctoral grants, referred to as the Fund for Scientific Research (*Guidelines on the formation and use of the fund for the support of scientific research* – **Annex A.1.3.3 2**, broken down by centralized research and faculty research funds), which is mainly intended to support young researchers, including PhD students, to attend prestigious international conferences and to cover publication fees in internationally indexed journals.

Consequently, between 2016-2020 numerous participation fees, travel expenses in relation international conference attendance and internships were paid from the research fund of the Faculty of Automation, Computers and Electronics, as well as from research projects (coordinated by Doctoral supervisors). Within the past 5 years, PhD students in the field of Engineering Systems, such as Andreea Șoimu, Van Dong Hai Nguyen, Radu-Lucian Constantinescu, Bogdan Popa, Teodor-Constantin Nichițelea, Maria-Geanina Unguritu, Mădălin Lucian Mămuleanu, Mihai-Bebe Simion, Gheorghe Bujgoi, Anca Albița, etc. were supported by the payment of fees and travel expenses to attend prestigious conferences co-sponsored by IEEE (*Int. Conf. on System Theory, Int. Conf. on Methods and Models in Automation and Robotics, Control and Computing ICSTCC, Int. Carpathian Control Conf.,* etc.).

Annex A.1.3.3 3a presents a statement of the costs incurred by the UCv for the training of PhD students in the "Constantin Belea" Doctoral School, according to the aforementioned sources (Research Fund, Research Projects, etc.). Accordingly, significant amounts were invested, i.e., 112,147.40 lei between 2016-2020 (namely a percentage of 11.28% of the SDCB income). It should be mentioned that in this calculation the students' costs budgeted directly from SDCB funds are not considered (these are included in the sums given in Table A.1.1).

Since the accounting statements are made only at the SDCB level, *to estimate the income in the Systems Engineering Doctoral Field in the last 5 years*, we further present the status of the doctoral students enrolled in each academic year. Thus, in the academic years from 2015 to 2020, 154 PhD students were enrolled (73 on the budgeted places and 81 in the tuition system) in the entire "Constantin Belea" Doctoral School (the enrolment of PhD students per academic year is envisaged, i.e., 154 students-year was considered) – **Annex A.1.3.3 3b**. In the Doctoral Field of Systems Engineering, 35 PhD students were enrolled (13 on budgeted places and 22 in the tuition-based system). Accordingly, the percentage of doctoral students in the SE Doctoral Field compared to the total number of the SDCB students is 22.72% (17.80% on budgeted places, 27.16% in the tuition-based system). Therefore, the income in the field of Systems Engineering represented not more than one third (33.33%) of the total income of the SDCB. This results in an income of a maximum of **331,389 lei** in 2016-2020 (see the total in Table A.1.1).

According to **Annex A.1.3.3 3c**, between 2016 and 2020 an amount of **45,481 lei** was spent from additional funds (Research Fund, Research Projects), see also Table A.1.2. This amount, although not spent directly from the funds of the Doctoral School, represents a percentage of **13.72%** of the income generated in the field of Systems Engineering previously estimated. We note that in this calculation, the costs that are included in the amounts shown in Table A.1.1 were not taken into consideration (i.e., the costs for the Systems Engineering field from the SDCB funds).

Table A.1.2. Statement of training costs for doctoral students in Systems Engineering (additional funds: Research Fund, Research Projects), 2016-2020

Year	Additional costs for SE doctoral students training (Lei)	Percentage of the ES estimated income
2016	10,271.97	12.22%
2017	19,474.75	28.03%
2018	12,607.55	36.37%
2019	1,423.23	1.93%
2020	1,704.29	2.45%
Total	**45,481.79**	**13.72%**

The Covid19 context caused a decrease in the number of travelling opportunities of PhD students to attend conferences, internships and summer schools. However, in 2021 the allocation of funds from the Doctoral School was designed with a view to attendance of conferences that have accepted students' contributions (such as *IEEE Electronics 2021*, Geanina Unguritu, *IEEE Eurasia Conf. Biomedical Eng. ECBIOS2021*, Mădălin Mămuleanu, etc.).

A.2. Research Infrastructure

A.2.1. IOSUD owns a modern research infrastructure that supports the development of the activities specific to doctoral studies

A.2.1.1. The research infrastructure in the Doctoral School allows the realization of research activities, in the evaluated doctoral field, in accordance with the mission and objectives assumed (computers, specific software, equipment, laboratory equipment, library, access to international databases, etc.)

Criterion: the research infrastructure allows for the conduct of research activities. The infrastructure and the research services provision are available via a platform. The research infrastructure described above is highlighted separately, as purchased and developed in the last 5 years.

The research infrastructure of the IOSUD - University of Craiova at the Doctoral School of Systems Engineering within the "Constantin Belea" Doctoral School includes a library, access to international databases, research laboratories, computing facilities.

Available units in the UCv library (lecture halls, books, journals, collections, etc.)

The University of Craiova has a Library that manages over 1,000,000 volumes, including 28,000 special collections, and over 3,000 journal titles. The Library works with more than 85 Inter-librarian exchange partners abroad and 45 in the country. The web page of the Library offers the possibility to consult the online database of the book fund (http://biblio.central.ucv.ro/index.html) and other useful information about the programme, locations, possibilities for interactive communication with library services and links to online databases made available on the university campus.

Annex A.2.1.1 1 shows the Operating Regulation of the Library, the organization chart, the budget, the reading rooms, the specialized books in the field of Systems Engineering, the international databases to which the University of Craiova has online access, as well as the specialized journals. *The Library of the Faculty of Automation, Computers and Electronics*

provides the Doctoral students and the teaching staff members in the field of Systems Engineering with onsite reading facilities and a home loan centre with a book fund of 62,758 volumes, a reading room with free access to the shelf accommodating 30 seats and a fund of 5,854 volumes. There is also a periodicals fund and a store housing 9,978 volumes and a reading room accommodating 20 seats. These rooms are also equipped with 6 PCs and 2 multifunction printers.

At the end of 2020, the online catalogue of the UCv Library included more than 348,000 titles. The activities of documentation and electronic communication of information to users, within the Covid19 context, totalled a number of 9,111 virtual transactions in 2020, and the number of virtual visitors to the Library resources amounted to 389,129.

UCv provides online access to more than 10 references, bibliographic, or scientometric bases for the scientific data, with the updated volumes and periodicals (within the Association of Universities, Research and Development Institutes and Central University Libraries of Romania, "ANELIS PLUS") http://biblio.central.ucv.ro/bib_web/ro/Anelis_Plus.php, which also cater for the field of System Engineering:

1. SCIENCE DIRECT FREEDOM COLLECTION
2. SPRINGERLINK JOURNALS
3. TAYLOR and FRANCIS JOURNALS (archive)
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 full text scientific database http://www.arXiv.org provides an excellent documentation source in the field of Systems Engineering.

The Library infrastructure is publicly presented and available via an online catalogue, TINREAD, that enables users to access information related to the location, availability of copies and code, as well as full-text publications (http://catalog.ucv.ro/opac). The publications' offer is publicly presented via ***ANELIS Mobile platform*** (http://www.anelisplus.ro/?page_id=64). According to the statistics provided by Anelis Plus Association (Jan. 2020 – Dec. 2020), more than 365,183 hits (in UCv) of users based on IP and mobile access were recorded.

Laboratories equipment for teaching and research

The PhD students and members of the Doctoral School in the field of System Engineering activate in the Department of Automation and Electronics and carry out their research work in the following laboratories (described *in extenso* in **Annex_A.2.1.1_2**) that provide support to carry out research and teaching activities:

1. Laboratory for Modelling, Identification and Management of Biochemical and Biotechnological processes (MICBIO-INCESA)

The laboratory has specialized hardware and software equipment for the modelling, identification and control of processes in general, and for biochemical and biotechnological processes in particular, benefitting Master's and Doctoral students. The members of the Doctoral School also have access to other laboratories and facilities of INCESA (see further description).

2. The "Industrial Process Control" Laboratory – CPI (Continental)

The laboratory has specialized hardware and software equipment: measurement and control systems (data acquisition boards, oscilloscopes, signal generators, measuring devices), advanced computing technology equipped with numerical data acquisition and control systems, specialized software for process control, modern teaching equipment for video presentation, air conditioning.

The Continental Laboratory was modernized and equipped (including with computing technology) through the sponsorship of **Continental Automotive Sibiu** and the contribution of the Faculty of Automation, Computers and Electronics (in the period 2017-2019, over 20,000 Euros were spent **Annex A.2.1.1_3**).

3. "Hella Embedded Club" and "Programming & Numerical Simulation" Laboratories

Provides logistical support in carrying out activities on *Embedded Systems* (especially in Automotive Control) and programming and numerical simulation.

The Hella Laboratory was modernized and equipped (including with computers) through the sponsorship of **Hella Craiova** and the contribution of the Faculty of Automation, Computers and Electronics (2012-2016, 50,000 Euros were spent, **Annex A.2.1.1_3**).

4. The "Engineering and computer aided design" Laboratory - IPA

The laboratory provides logistical support for carrying out scientific research activities oriented to engineering and computer aided design, is also equipped with data acquisition systems and virtual instrumentation based on the National Instruments techniques.

5. The "Hydraulic and pneumatic systems" Laboratory - SHP

The laboratory is equipped for research on the directions of hydraulic and pneumatic systems, identification of systems and control of electrical processes and has several specialized systems and equipment (*Telemecanique* speed variators for electric machines, SMC teaching platforms), computers, etc.

6. The "Control systems and equipment" Laboratory - SEC

The laboratory provides logistical support for research activities in the field of automatic control, with computers, numerical controllers, Quanser data acquisition and control systems, LabVolt experimental control platforms, etc.

All research laboratories related to the field of Systems Engineering have specialized equipment (hardware), computing technology, specialized software, modern teaching equipment for video presentation and air conditioning.

INCESA (Research Hub of Applied Sciences)

PhD students and members of the Doctoral School can carry out scientific research activities in **INCESA laboratories (Research Hub of Applied Sciences)**, a state-of-the-art research infrastructure of the University of Craiova that promotes excellence in the field of Applied Sciences. ***The INCESA hub and research services offer are publicly presented on the EERIS platform:*** http://erris.gov.ro/Research-Infrastructure-in-A. INCESA laboratories are equipped with cutting-edge equipment and software and provide conditions for conducting high-level research activities and experiments (**Annex A.2.1.1_4**). The infrastructure was developed within the SMIS-13845 Project (budget 12,400,000 Euros), implemented between 2010 and 2016. The equipment provided in the INCESA Centres, i.e., the Centre for Research in the Field of Computer Science and Engineering (CCDSC), the Centre for Research in the Field

of Biotechnology and Bioengineering (CCDBB), and the Centre for Research in the Field of Electrical Engineering (CCDIE) are available to Doctoral students. In the field of Systems Engineering, the *Modelling, Identification and Management of Biochemical and Biotechnological Processes* MICBIO Laboratory (previously described) facilitates research activities carried out by Master's and Doctoral students.

It should be noted that 3 major projects for the renovation and modernization of teaching and research buildings of the Electrical Faculties Campus were submitted and declared winners. These projects, with a total amount of more than 18 million Euros will be funded form the European Funds – S-W Oltenia Region, through *POR 2014-2020, Priority Axis 10 - Improving the educational infrastructure, Operation 10.3 - Increasing the relevance of tertiary university education in relation to the labour market and competitive economic sectors.* Through these projects, the buildings will be consolidated, new elevators will be installed, all buildings will be thermally rehabilitated, the facades of the buildings will be remodelled, the existing installations will be replaced, the rooms will be equipped with specific furniture, library and laboratory equipment, with multimedia equipment and software, etc. The estimated completion date of the planned works is 29.12.2023.

The research infrastructure available for the **Systems Engineering Doctoral Field** includes high-performance equipment, software packages and development environments, of which we mention ***some purchased in the last 5 years*** (**Annex_A.2.1.1_5**):

Hardware:

- Quanser experimental platform, equipped with NI cRIO-9024 Embedded Controller, NI cRIO-9113 module, equipped with FPGA, Q1-cRIO acquisition module, Quanser Rapid Control Prototyping Toolkit Add-on software, software modules for data acquisition developed in LabVIEW [2015, National Instruments (USA) + Quanser (Canada), 100,000 lei]
- Brunswick Bioreactor and auxiliary equipment [2014-2015, Eppendorf, Germany, 100,000 lei]
- Development boards, networking and laboratory equipment: Development Boards dsPICPRO4, dsPIC30F6014A; Development Systems Type 850esfx3-CANIT; Ethernet, LIN, ZigBee boards; sensors; various equipment (oscilloscopes and generators Tektronix, sources)
- LENOVO portable computing systems (3 pcs.) and multifunction printer [2018, 2019, from MOSCBIOS project, approx. 30,000 lei]
- ASUS desktop computers (3 pcs.), equipped with HP printer, External Hard Drive, UPS, etc. [2016, 2017, from ADCOSBIO project, approx. 11,000 lei]
- LENOVO LEGION portable computing systems (10 PCs.) [2018, from the TISIPRO project, approx. 37,000 lei]
- Workstation with process computer NATIONAL INSTRUMENTS cRIO-9039 (1 pc.) [2019, from the TISIPRO project, approx. 137,000 lei]

Software:

- Specialized software for monitoring and control of bioprocesses New Brunswick BioCommand Track & Trend Software, OPC server [2015, Eppendorf, Germany, 25.000 lei]
- Microsoft Office 2016 software package [2017, ADCOSBIO project, approx. 1,000 lei]
- Industrial PLC programming system, SIEMENS SIMATIC FIELD [2018, from TISIPRO project, approx. 30,000 lei]

In addition to recent purchases, equipment offered through sponsorship by Hella and Continental in 2016-2020 is also available (See descriptions of Continental and Hella laboratories).

The research services provision for the Doctoral field of Systems Engineering is indicated on the SCDB website, as well as in the other two doctoral fields of the Doctoral School (http://www.ace.ucv.ro/sdcb/organizare.html).

The previous descriptions highlight that the research laboratories are equipped with cutting-edge equipment, thus enabling the development of research activities with a high degree of complexity. Overall, the University of Craiova infrastructure, available to the evaluated field, corresponds to the standards that ensure the performance of quality activities, within the Doctoral field of Systems Engineering.

A.3. Quality of human resources

A.3.1. At the level of each doctoral school, qualified staff with the required experience to carry out the programme are employed

A.3.1.1. Doctoral supervisors in Systems Engineering. The meet of CNATDCU standards compliance

Criterion: within the doctoral field, there are at least three doctoral supervisors and at least 50% of them (but no less than three) meet the minimum standards of the National Council for Attesting the University Titles, Diplomas and Certificates (CNATDCU) in force at the moment of carrying out the evaluation, as required and mandatory for obtaining the habilitation certificate.

In the field of *Systems Engineering* 5 Doctoral supervisors (2 female supervisors and 3 male supervisors) are active, ***all full-time members of the University of Craiova teaching staff***:

- Professor Eng. Dan POPESCU, PhD - since 2008
- Professor Eng. Dan SELIȘTEANU, PhD – habilitated in 2016
- Professor Eng. Monica ROMAN, PhD – habilitated in 2019
- Professor Eng. Dorin ŞENDRESCU, PhD – habilitated in 2019
- Professor Eng. Daniela DANCIU, PhD – habilitated in 2019

Table A.3.1 indicates the degree of compliance per Doctoral supervisor, in April 2021, that meet the minimum standards of the CNATDCU currently in force, required and mandatory for the award of the certificate of Habilitation in the field of Systems Engineering (**Annex_A.3.1.1_1**).

Note. The minimum standards of the CNATDCU 15 Commission are as follows: total score 850; on criteria A1 + A2 + A3 = 100+600+150; minimum conditions (books / Art. ISI / Q1, Q2 / Project Director / No. of ISI citations / Impact Factor ISI) 1 / 15 / 3 / 2 / 25 / 10.

According to the table, all five Doctoral supervisors activating within the "Constantin Belea" Doctoral School, Doctoral field of Systems Engineering, fully meet (100%) the current CNATDCU minimum standards in force, required and mandatory for the award of the certificate of Habilitation.

The fulfilment of the minimum standards for the award of the certificate of Habilitation per Doctoral supervisor is indicated in **Annex_A.3.1.1_1**.

Table A.3.1. Degree of fulfilment with the minimum standards per Doctoral supervisor in the Systems Engineering Doctoral Field

No.	First name and surname of the Doctoral supervisor / institution	Order granting the right of Doctoral supervisor	Score achieved according to the minimum standards required and mandatory for obtaining the certificate of habilitation CNATDCU Committee: 15. Computers, Information Technology and Systems Engineering [OMENCS no. 6129 / 20.12.2016] http://www.cnatdcu-c15.org/	Comments
1.	Professor Eng. Dan POPESCU / University of Craiova (UCv)	Order 3292/ 26.02.2008	Total score: **2,588.51** Criteria A1+A2+A3: 221.75 +1,588.97+777.79 Minimum standards (books / Art. ISI / Q1, Q2 / Project Director / No. of ISI citations / IF ISI): 4 / 51 / 6 / 16 / 160 / 34.38	Fulfilled
2.	Professor Eng. Dan Selișteanu, PhD /UCv	Order 4010/07.06. 2016	**4,007.18** 354.08+2,245.27+1,407.83 6 / 86 / 18 / 5 / 348 / 99,92	Fulfilled
3.	Professor Eng. Monica ROMAN /UCv	Order 3821/01.04. 2019	**2,177.12** 177.28+1,434.78+565,06 3 / 53 / 12 / 3 / 121 / 62,73	Fulfilled
4.	Professor Eng. Dorin ŞENDRESCU /UCv	Order 3822/01.04. 2019	**1,958.74** 174.38+1,214.67+569.69 6 / 44 / 5 / 2 / 122 / 35,47	Fulfilled
5.	Professor Eng. Daniela DANCIU /UCv	Order no. 4105/ 28.05.2019	**1,808.97** 276.58+1,154.26+378.13 2 / 35 / 5 / 4 / 56 / 25,78	Fulfilled

The CVs of the Doctoral supervisors, as well as of the teaching staff for: *Ethics and Academic Integrity* (Professor Edmond Gabriel OLTEANU, Doctoral supervisor in the field of Law) and *Methodology of Scientific Research* (Professor Costin BADICĂ, Doctoral supervisor, the field of Computer Science and Information Technology) are enclosed in **Annex A.3.1.1_2**.

Within the Doctoral School of Systems Engineering also activate members (teaching and research staff) that do not hold the title of Doctoral supervisors (CVs in **Annex A.3.1.1_3**): Professor Eng. Cosmin Ionete, Professor Eng. Dorina Purcaru, PhD Associate Professor Eng. Ion Marian Popescu.

*A.3.1.2. Full-time employment of the Doctoral supervisors within the IOSUD - University of Craiova, Doctoral field of Systems Engineering

Criterion: at least 50% of the PhD supervisors in the evaluated doctoral field are employed full time within IOSUD, i.e., contract-based full-time permanent employment.

All 5 Doctoral supervisors are employed full time within the University of Craiova, based on a permanent employment contract (**Annex A.3.1.2_1**, positions 80 - 84): Professor Eng. Dan POPESCU, PhD, Professor Eng. Dan SELIȘTEANU, PhD, Professor Eng. Monica ROMAN, PhD, Professor Eng. Dorin ŞENDRESCU, PhD, Professor Eng. Daniela DANCIU, PhD).

Annex A.3.1.2_2 encloses the Teaching load reports (from 2016-2021) of the "Constantin Belea" Doctoral School, including the tenured teaching staff in the field of Systems Engineering, specifying the supervised Doctoral students and the teaching tasks.

A.3.1.3. The tenured teaching staff of the academic subjects of the training program based on advanced university studies related to the field of Systems Engineering

Criterion: The subjects in the training programme based on advanced academic studies in the field are supported by teaching staff or researchers who hold the title of doctoral supervisor / are habilitated, Professor / Researcher I or Associate Professor / Researcher II with expertise in the field of the subjects taught, or by other specialists in the field that meet the standards established by the institution for the aforementioned teaching and research positions, in accordance with the law.

The subjects in the training programme and the tenured teaching staff are as follows (See also the curriculum for the academic year 2020-2021– **Annex_A.3.1.3_1,** as well as the syllabi - **Annex_A.3.1.3_2**):

1. *Robust control Systems*; Professor Eng. Dan POPESCU, PhD
2. *Systems Modelling and Identification*; Professor Eng. Monica ROMAN, PhD
3. *Adaptive control Systems;* Professor Eng. Dan SELIȘTEANU, PhD
4. *Numerical process management techniques (Digital Control Systems);* Professor Eng. Dan POPESCU, PhD
5. *Embedded Control Systems;* Professor Eng. Dorin ŞENDRESCU, PhD
6. *Predictive process management (Predictive Control Systems);* Professor Eng.Dorin ŞENDRESCU, PhD
7. *Industrial Networks*; Professor Eng. Dan SELIȘTEANU, PhD
8. *Intelligent Control Systems;* Professor Eng. Daniela DANCIU, PhD
9. *Methodology of Scientific Research;* Professor Eng. Costin BĂDICĂ, PhD
10. *Ethics and Academic Integrity;* Professor Gabriel OLTEANU, PhD

Eight of the subjects of the training programme based on advanced studies in the Doctoral field of Engineering Systems are delivered by the 5 teaching staff members awarded with the academic titles of Professor and PhD supervisors in the field of Systems Engineering, and two of the academic subjects are delivered also by Professors, Doctoral supervisors (in the field of Computer Science and Information Technology, Professor Costin BADICĂ, PhD and in the field of Law, Professor Gabriel OLTEANU, PhD).

Annex_A.3.1.3_2 encloses the syllabi of the subjects in the curriculum of Systems Engineering, designed by the teachers in charge, and in **Annex_A.3.1.1_2** the CVs of the tenured teaching staff members are presented, thus attesting their expertise in the field of the subjects taught.

**A.3.1.4. The percentage of Doctoral supervisors who coordinate more than 8 PhD students, but no more than 12 Doctoral students enrolled to the doctoral programme*

Criterion: the percentage of doctoral supervisors who coordinate more than 8 doctoral students, but no more than 12 doctoral students enrolled to the doctoral programme does not exceed 20%.

The list of the current 14 doctoral students coordinated by the PhD supervisors in the field of Systems Engineering is presented in **Annex_A.3.1.4_1**:

- Professor Eng. Dan POPESCU – 0 Doctoral students
- Professor Eng. Dan SELIȘTEANU – 10 Doctoral students
- Professor Eng. Monica ROMAN – 1 Doctoral student
- Professor Eng. Dorin ŞENDRESCU – 3 Doctoral students
- Professor Eng. Daniela DANCIU – 0 Doctoral students

Accordingly, only one Doctoral supervisor out of the 5 coordinates simultaneously 10 doctoral students (one student undertakes programme extension), which means that the proportion is 20% - the criterion is met.

A.3.2. The doctoral supervisors within the doctoral school carry out internationally visible scientific activities

A.3.2.1. Indexed publications WoS and international visibility in the last 5 years of Doctoral supervisors in the field of Systems Engineering

Criterion: At least 50% of the doctoral supervisors in the evaluated field have at least 5 publications in journals with impact factor indexed by Web of Science or ERIH, or other achievements, which are relevant for the corresponding field, in which there are international contributions that show progress in scientific research-development-innovation in the evaluated field. The previously mentioned Doctoral supervisors have acquired international visibility in the last five years, based on: membership in the scientific committees of international publications and conferences; membership in the boards of international associations; as invited professors at conferences or expert groups held abroad or as members of doctoral thesis defence committees at universities abroad or within joint doctoral programmes.

All 5 Doctoral supervisors in the field of Systems Engineering have more than 5 Web of Science indexed papers (Clarivate Analytics) in high-impact Journals, most of them in Q1/Q2 quartiles (see **Annex A.3.2.1 1** Lists of significant scientific papers and **Annex A.3.2.1 2** - Significant papers).

All 5 Doctoral supervisors have acquired international visibility in the last 5 years (2016-2020): members of editorial boards (of international journals and conferences), members of committees of international associations, visiting professors, members of Thesis defence committees, etc. (International visibility – **Annex A.3.2.1 3**). **Annex A.3.1.1 2** encloses the CVs of the PhD supervisors, highlighting additional elements of international visibility.

**A.3.2.2. The fulfilment of at least 25% of the score required by the CNATDCU minimum standards required and mandatory to obtain the habilitation certificate, based on the Doctoral supervisors' scientific results in the last five years, in the field of Systems Engineering*

Criterion: at least 50% of the Doctoral supervisors assigned to a field of doctoral studies continues to be scientifically active, obtaining at least 25% of the score required by the CNATDCU minimum standards in force at the date of evaluation, required and mandatory, in the last five years.

All five Doctoral supervisors in the field of Systems Engineering meet the A.3.2.2 criterion, achieving in the last 5 years (2016-2020) more than 25% of the score required by the

CNATDCU minimum standards required and mandatory for the award of the habilitation (850 p. – Commission 15 CNATDCU):

- Professor Eng. Dan POPESCU, PhD – 107.69%
- Professor Eng. Dan SELIȘTEANU, PhD – 161.99%
- Professor Eng. Monica ROMAN, PhD – 100.16%
- Professor Eng. Dorin ŞENDRESCU, PhD – 67.87%
- Professor Eng. Daniela DANCIU – 82.71%

See **Annex A.3.2.2** for further details. The summary of the degree of fulfilment of the habilitation standards is provided in the table below.

Table A.3.2. Degree of fulfilment with the minimum standards per PhD supervisor in the Systems Engineering Doctoral Field

No.	First name and surname of the Doctoral supervisor / institution	Score achieved according to the minimum standards required and mandatory for the award of the certificate of habilitation CNATDCU Committee: 15. Computers, Information Technology and Systems Engineering [OMENCS no. 6129 / 20.12.2016] http://www.cnatdcu-c15.org/ 2016-2020	Comments on the fulfilment of the indicator (over 25% in the last 5 years)
1.	Professor Eng. Dan POPESCU, PhD/UCv	Total score in last 5 years: **915.40** Criteria A1 + A2+A3: 17.50+601.30+296.60	107.69% Fulfilled
2.	Professor Eng. Dan SELIȘTEANU, PhD/UCv	**1,376.97** 55.20+545.37+776.40	161.99% Fulfilled
3.	Professor Eng. Monica ROMAN / UCv	**851.40** 55.20+445.28+350.92	100.16% Fulfilled
4.	Professor Eng. Dorin ŞENDRESCU / UCv	**576.95** 2.08+146.62+428.25	67.87% Fulfilled
5.	Professor Eng. Daniela DANCIU / UCv	**703.07** 8.33+477.52+217,22	82.71% Fulfilled

B. Educational Efficiency

B.1. Number, quality and diversity of candidates participating in the admission examination

B.1.1. The institution authorised to organise doctoral programmes has the capacity to attract a larger number of candidates than the number of budgeted places

*B.1.1.1. Master graduates of other higher education institutions in the country or abroad that have applied for the admission contest / the ratio of the number of candidates to the number of places funded from the budget

Criterion: The ratio between the number of Master's degree graduates from other higher education institutions in the country or abroad who have participated in the admission to doctoral programmes in the last five years and the number of state-subsidised places available at the doctoral school is of at least 0.2, or the ratio between the number of applicants in the last five years and the number of state-subsidised places is at least 1.2.

In the period 2015-2020, 1 candidate who does not come from own Master's programmes (Van Dong Hai Nguyen, Vietnam, 2015) entered the admission contest. In 2015-2020, 5 state-subsidised places were allocated for admission to the Doctoral School, Systems Engineering Doctoral Field: 4 for Romanian PhD students and one for foreign PhD students (**Annex B.1.1.1**). Accordingly, the ratio of the number of Master's graduates from other higher education institutions in the country or abroad who entered the admission competition and the number of state-subsidised places allocated for the admission competition in the Doctoral Field of Systems Engineering is 1/5 = 0.2. In the academic year, 2020-2021, 2 state-subsidised places were allocated to the Doctoral field of Systems Engineering. Therefore, if the admission from 2020-2021 is taken into account, we have 7 state-subsidised places and 2 candidates who did not graduate from the Master's programmes of the University of Craiova (Van Dong Hai Nguyen, Vietnam, 2015 and Horia Capriță, "Lucian Blaga" University of Sibiu, 2020), that is, 2/7 = 0.28.

To fill the 5 state-subsidised places for admission to the Doctoral School of Systems Engineering in the period 2015-2020, 10 candidates registered for the admission exam (**Annex B.1.1.1**), i.e., a ratio of 10/5 = 2 (>1.2). If the admission of 2020-2021 is also taken into account, we have 7 state-subsidised places and 16 candidates (i.e., 16/7 = 2.28). Consequently, both criteria in B.1.1.1 are met.

B.1.2. The candidates admitted to the doctoral programmes are of the highest quality

*B.1.2.1. Admission to doctoral programmes is based on selection criteria

Criterion: Admission to doctoral programmes is based on selection criteria including: academic, research and professional performance of candidates, their interest in scientific or artistic/sports research, publications in the field and a research theme proposal. An interview with the applicant is a mandatory part of the admission procedure.

Admission to the Doctoral Programme in the field of Systems Engineering is made on the basis of quality criteria, presented in *the evaluation criteria for admission to the doctoral*

studies within the "Constantin Belea" Doctoral School (Annex_A.1.1.1_7). Candidates are selected according to:

- the multiannual average grade of the Bachelor's programme and the average grade of the Bachelor's graduation examination;
- the multiannual average grade of the Master's/Postgraduate studies and the average grade of the dissertation examination;
- the quality and clarity of the directions proposed for the doctoral research topic, following the oral examination in the admission competition (interview);
- minimum proven experience in research and/or practical activities in the last 3 years (research projects, internships in companies in the field, minimum 6 months cumulatively);
- scientific papers published or presented in the doctoral field;
- awards at the final stages (national, international) of competitions and professional competitions in the doctoral field.

B.1.2.2. The drop-out rate of the doctoral students

Criterion: the drop-out rate of PhD students occurring in the first 3, respectively 4 years after admission does not exceed 30%.

Between 2015-2020, two PhD candidates in Systems Engineering were expelled (Elvira Nicoleta Gligor-Bîzdoacă, 2016-2017, and George Cristian Călugăru, 2017-2018) – see Annex_B.1.2.2. Taking into consideration the fact that in the period 2015-2020 a total of 18 Doctoral candidates were enrolled to the Doctoral School, we have *an expulsion/dropout rate of 11.11%.* In the academic year 2020 - 2021, no Doctoral student was expelled.

B.2. Content of doctoral programmes

B.2.1. The training programme based on advanced academic studies is liable to improve the research skills of the doctoral students and to strengthen ethical scientific behaviour

B.2.1.1. Relevant subjects in the advanced university-based training programme

Criterion: The training programme based on advanced academic studies includes at least three subjects relevant for the development of the students' scientific research skills, out of which at least one subject is related to the in-depth study of research methodology and/or statistical data processing.

The curriculum in the Systems Engineering Doctoral Field includes *8 academic subjects* focusing on contemporary research directions, *plus Methodology of Scientific Research* and *Ethics and Academic Integrity*. These subjects are presented in Section A.3.1.3 of the Report. The offer of subjects is made annually by the Doctoral supervisors in accordance with the topics of the doctoral theses developed by the PhD students enrolled in the first year of studies and it is specified as annex to the study contract. The teaching activities related to the training programme are carried out over a period of 14 weeks, according to the structure of the academic year approved by the Senate of the University of Craiova. Evaluation of the students' knowledge of the subjects in the curriculum is carried out in the exam session of the semester in which the teaching activities are carried out. By attending the training programme, the Doctoral students acquire both professional and transversal skills. The curricula of the "Constantin Belea" Doctoral School in the period 2016-2021 are shown in Annex_A.3.1.3_1.

B.2.1.2. The subject dedicated to scientific research ethics and intellectual property

Criterion: The curriculum includes at least one subject dedicated to scientific research ethics and intellectual property, or well-defined such topics within a subject taught in the doctoral programme.

The curriculum of the Systems Engineering Doctoral Field (**Annex A.3.1.3 1**) contains the subject of *Ethics and Academic Integrity* in the first academic year, the first semester, taught by Professor Gabriel OLTEANU, PhD, member of the teaching staff at the Faculty of Law, University of Craiova, a subject that enhances transversal competences in understanding the notions of academic ethics in the research activity of Doctoral students. During the meetings between the Doctoral students and their Doctoral supervisors, the norms of academic conduct in relation to the teaching and research staff are explained and exemplified. The University of Craiova has the means to identify violations of academic integrity by establishing Advisory Committees for each Doctoral student to identify similarities between the research papers of the Doctoral student and the scientific works of other researchers. The Ethics and Academic Integrity Syllabus is presented in **Annex A.3.1.3 2**.

B.2.1.3. IOSUD has created mechanisms to ensure that the training programme based on advanced academic studies aims at "learning outcomes"

Criterion: IOSUD has created mechanisms to ensure that the training programme based on advanced academic studies, in relation to the evaluated field, aims at "learning outcomes", specifying the knowledge, skills and responsibility and autonomy that doctoral students should acquire by studying each subject or through research activities.

IOSUD - UCv has developed and implemented the mechanisms that ensure that within the advanced doctoral studies programme in the field of Systems Engineering Doctoral students acquire the relevant knowledge, skills, values and attitudes following the completion of the subjects provided in the curriculum and the research activities. These are specified in the subject syllabi, see **Annex A.3.1.3 2**. *The Institutional Regulation on the organization and functioning of the doctoral and postdoctoral university studies programmes at IOSUD-UCv* (**Annex A.1.1.1 1**) specifies the mechanisms by which the training programme based on advanced university studies targets the learning outcomes (Chapters III and V). Thus, IOSUD makes sure that the PhD students develop methods and techniques that are indispensable for research, “including the synthesis and evaluation skills needed to solve critical research and / or innovation problems and to expand and redefine existing professional knowledge or practice” (Annex 1: National qualifications framework, G.D. 132/2018, O.M. 273/28.03.2018). The content of the curricula is analysed in the Council of the Doctoral School.

The theoretical knowledge, competences and the research autonomy built up during the training programme are evaluated in the meetings with the strategic partners of the Faculty of Automation, Computers and Electronics (Continental Automotive Sibiu, Hella, Craiova, CS Romania, QFort, and other companies, the employees of some of these companies are Doctoral students in the SE field - see also Section 3 of the present Self-Evaluation Report).

Also, within scheduled meetings with the Advisory committees (see also Section B.2.1.4) and the presentation of the research reports, Doctoral students are advised on how to approach research activities independently and responsibly. Finally, the learning outcomes are reflected in the doctoral thesis.

B.2.1.4. Doctoral students' counselling/guidance in functional advisory committees

Criterion: Throughout the doctoral training period, the doctoral students in the field benefit from the counselling/guidance of functional advisory committees, as reflected by guidance and written feedback or regular meetings.

The Doctoral students admitted to doctoral programmes, starting from the academic year 2015-2016, from the counselling/guidance of functional advisory committees made up of Doctoral supervisors and 3 specialists, teaching or research staff members in the field of the doctoral topic. The functional advisory committee is active throughout the period of preparation of the doctoral thesis, provides expert advice to the Doctoral student, participates in the evaluation of the research activity during the training programme and in the yearly defence of the research reports. The functional advisory committee analyses and draft reports on the quality of the doctoral thesis and consents to or rejects the defence of the doctoral thesis in front of the Thesis defence committee. Since 2020, due to the pandemic, the mentoring activity has moved online, on the institutional platforms available, both for regular meetings and for the exam sessions and the submission of research reports (for example, Google Suite for Education Systems, CISCO-Webex, etc.).

Functional advisory committees are allocated for all PhD students in the field of Systems Engineering, our students praise the valuable collaboration with the members of these committees. Thus, according to the surveys conducted among PhD students (through the PhD students Evaluation Questionnaire of the Doctoral School and the Study Programme – **Annex C.1.1.2 1**), students' feedback on the criteria C4 and C8 for the academic year 2019-2020 are indicated in the statistics of **Annex C.1.1.2 2a** (pp. 15 - 17), resulting in a high degree of satisfaction (excellent: 81.25%). Also, following the survey conducted in the academic year 2020-2021, PhD students in the field of Systems Engineering indicated a high degree of satisfaction with the criteria C4 and C8 (71.42% of the enrolled PhD students participated in the survey) – Figure B.2.1 (**Annex C.1.1.2 2b**). The two criteria are:

- C4 - Is the student constantly guided/advised in doctoral research by his/her PhD supervisor and the advisory committee?
- C8 - Do the meetings between the student, the supervisor and the advisory committee contribute to the clarification of some topic-related and to the progress of doctoral scientific research?

For a clearer picture, **Annex B.2.1.4 1** shows a Study Contract in the field of Systems Engineering that mentions the advisory committee members, and **Annex B.2.1.4 2** provides detail on the advisory committee in the SE Doctoral Field.

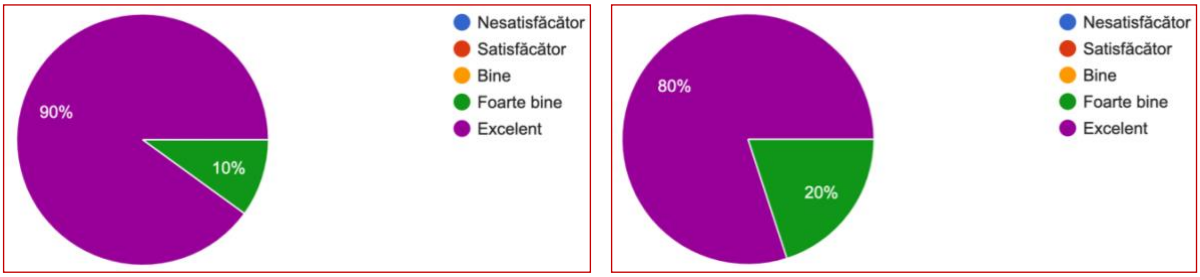

Figure B.2.1. Survey results on the C4 (left) and C8 (right) criteria – Doctoral students in Systems Engineering, 2020-2021

B.2.1.5. The ratio between the number of Doctoral students and the number of teaching staff

Criterion: In every doctoral field, the ratio between the number of PhD students and the number of teaching staff/researchers providing guidance must not exceed 3:1.

Currently, 14 students (2 female students and 9 male students) are enrolled in the field of Software Engineering - see Table B.2.1 (see also **Annex B.2.1.5**), 5 Doctoral supervisors in the field of Engineering Systems (see Table 3.1), 2 Doctoral supervisors that facilitate training in the specialised subjects of *Methodology of Scientific Research* and *Ethics and Academic Integrity* and 3 other teaching staff (teaching and research staff) that are not conferred the PhD supervisor title, see section A.3.1.1. Thus, a ratio of 14:5 = 2.8:1 (PhD students/PhD supervisors in the field of ES), respectively a ratio of 14:10 = 1.4:1 (PhD students/total number of the teaching staff) results, i.e., the criterion is fulfilled.

Table B.2.1. Doctoral students enrolled in the Systems Engineering Doctoral Field

No.	Doctoral student: Name and surname	Enrolment Year	Doctoral supervisor
1	EPURE M. Dragoș-Ștefan	2020	ROMAN Monica
2	PURCARU (ALBIȚA) I. Anca	2020	SELIȘTEANU Dan
3	CĂPRIȚĂ V.I. Vlăduț Horia	2020	SELIȘTEANU Dan
4	BORĂSCU I. Ion	2020	ȘENDRESCU Dorin
6	GAGIU M. Gheorghe-Daniel	2020	ȘENDRESCU Dorin
6	MĂMULEANU V.M. Mădălin-Lucian	2019	SELIȘTEANU Dan
7	MUSTĂȚEA I. Codrin-Tiberiu	2019	SELIȘTEANU Dan
8	VOINEA L. Ștefan-Vlad	2019	SELIȘTEANU Dan
9	BUJGOI C. Gheorghe	2019	ȘENDRESCU Dorin
10	NICHIȚELEA C. Teodor-Constantin	2018	SELIȘTEANU Dan
11	UNGURITU G. Maria-Geanina	2018	SELIȘTEANU Dan
12	NICOLA N. Claudiu-Ionel	2018	SELIȘTEANU Dan
13	SIMION G. Mihai-Bebe	2018	SELIȘTEANU Dan
14	CONSTANTINESCU B.V. Radu-Lucian	2016	SELIȘTEANU Dan

B.3. Outcomes of doctoral programmes and the evaluation procedures

B.3.1. Research is capitalised by doctoral students through presentations delivered at scientific conferences, scientific publications, technology transfer, patents, products, service provision

B.3.1.1. Relevant contributions per Doctoral student in the SE Field (2015-2020)

Criterion: in the evaluated field, at least one scientific paper or another relevant contribution per doctoral student who has been awarded the PhD title in the last 5 years is made available from the list, the members of the evaluation team randomly select for analysis 5 such relevant papers/contributions per the doctoral programme field.

In the period 2015-2020, 7 Doctoral students graduated from the Doctoral Field in Systems Engineering, see the summary Table B.3.1. All 7 of them presented papers at scientific conferences and/or published them in relevant journals in the field, at least one paper per doctoral student is available, all doctoral theses being validated by the CNATDCU and the PhD titles were awarded following the first public defence. The relevant contributions of the graduates from the Doctoral School of Systems Engineering are presented in the lists and databases of representative papers in **Annex B.3.1.1_1**.

Table B.3.1. PhD titles award in Systems Engineering (last 5 years)

No.	Graduate name	Doctoral thesis title	PhD supervisor	Year	Minister Order awarding the title	Current employment
1	MONEA Bogdan-Florian	*Innovative measurement techniques in cryogenic process control systems*	PETRE Emil	2020	3461 / 08.03.2021	ICSI Rm. Vâlcea
2	POPA Bogdan	*High-performance algorithms for image and signal processing*	POPESCU Dan	2019	5748 / 13.10.2020	Junior Lecturer, UCv
3	LORINCZ Alexandra-Elizabeth	*Contributions on mobile communications in automotive control systems*	SELIȘTEANU Dan	2019	5748 / 13.10.2020	IT company (embedded systems)
4	NGUYEN Van Dong Hai	*Control algorithms for balancing pendulum models with elastic components*	IVĂNESCU Mircea	2018	5474 / 14.11.2018	Prof., Ho Chi Minh Univ., Vietnam
5	ȘOIMU Andreea Valentina	*Applications of predictive control*	RĂSVAN Vladimir	2016	3769 / 20.04.2017	Junior Lecturer, UCv
6	MATEI Lucian	*Contributions to the optimization of road transport systems, with application to the city of Craiova*	VÎNĂTORU Matei	2016	3769 / 20.04.2017	Senior Lecturer, UCv
7	DICU Gheorghe Doru	*Monitoring and control system of environmental parameters in premises intended for telecommunications equipment*	VÎNĂTORU Matei	2015	5954 / 07.12.2015	Company (telecommunications)

The educational effectiveness of the Doctoral Studies Program Systems Engineering can also be evaluated by analysing the professional development of the graduates between 2015 and 2020. Thus, of the 7 graduates, 4 are University teaching staff members (3 at UCv and one abroad), one is a researcher at the National Research-Development Institute for Cryogenic and Isotopic Technologies (ICSI) Rm. Vâlcea, and two are employed by IT companies (Table B.3.1).

Currently, 14 Doctoral students are enrolled to the Doctoral field of Systems Engineering, as shown in Table B.2.1. The relevant contributions of the doctoral students enrolled in the SE doctoral field are presented in the lists in **Annex B.3.1.1_2**. *The Doctoral students* at the Doctoral School of Systems Engineering have capitalised on the theoretical knowledge and the experimental results obtained in the research groups by publishing numerous scientific papers (before admission to the Doctoral programme and as doctoral students). Thus, more than 10 scientific papers have been published in ISI and IDB rated journals and more than 30 scientific papers have been presented in international events.

*B.3.1.2. The ratio between the number of presentations delivered by the doctoral students who successfully completed the doctoral programme

Criterion: the ratio between the number of presentations delivered by the PhD students who successfully completed the doctoral programme during the evaluated period (in the last 5 years), including posters and exhibitions, at prestigious international events (held in the country or abroad) and the number of the PhD students who successfully completed the doctoral programme during the evaluated period (in the last 5 years) is at least equal to 1.

Presentations, including poster presentations, exhibitions, at prestigious international events (in the country or abroad) are reported in **Annex B.3.1.2.**

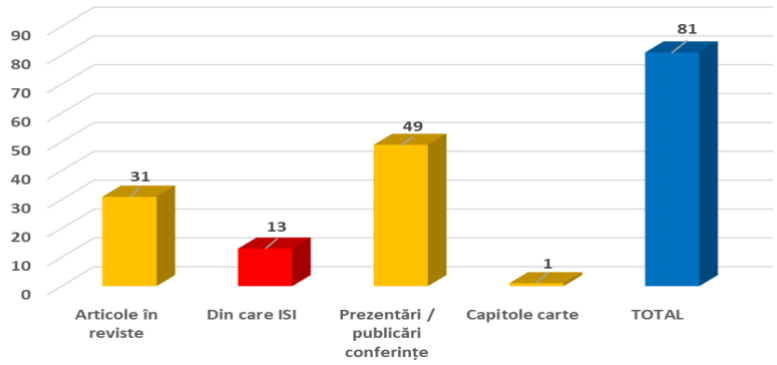

Figure B.3.1. Statistics on the publications of the "Constantin Belea" Doctoral School graduates, Systems Engineering Doctoral Field, 2015-2020

The number of these presentations is higher than the number of students who have completed their doctoral studies in the last 5 years: 49 presentations at international conferences delivered by 7 graduates in Systems Engineering, **resulting in a ratio of 7: 1.**

The 7 graduates from Systems Engineering in the last 5 years (2015 to 2020) have capitalised on the knowledge acquired and the experimental results achieved in their Doctoral theses and published more than 30 scientific a papers in high-indexed journal (31 papers, 13 in ISI journals), a book chapter, and the presentation of more than 40 scientific papers in international events (49 papers in the proceedings of the conferences, the majority ISI and IDBs Proceedings) - see **Annex_B.3.1.2** and Figure B.3.1.

B.3.2. External reviewers in the doctoral theses defence committees

*B.3.2.1. Number of doctoral theses per reviewer

Criterion: the number of doctoral theses assigned to a reviewer from a higher education institution, other than the evaluated IOSUD, must not exceed two (2) in the case of the theses coordinated by the same doctoral supervisor per year.

Annex_B.3.2.1 indicates the *members of the doctoral theses defence committees for the 7 graduates of the last 5 academic years*. According to these lists, a relatively wide spectrum of external experts have been included in the doctoral theses defence committees. There are no situations where the same external scientific referent has been appointed into more than two committees in the same academic year.

*B.3.2.2. The ratio between the number of doctoral theses assigned to a reviewer from a higher education institution other than the one in which the doctoral thesis defence is organised, and the number of doctoral theses defended in the same doctoral field

Criterion: The ratio between the number of doctoral theses assigned to a reviewer from a higher education institution other than the one in which the doctoral thesis defence is organised, and the number of doctoral theses defended in the same doctoral field within the doctoral school must not exceed 0.3, with reference to the last five years. *Only those doctoral fields in which at least ten doctoral theses have been defended in the last five years shall be considered.*

In the Systems Engineering Doctoral Field, as indicated in the previous sections, in the last 5 academic years (see Table B.3.1) 7 doctoral theses (< 10) have been publicly defended.

C. Quality Management

C.1. The existence and regular development of the Internal Quality Assurance System

C.1.1. The institutional framework is in place and a procedure for monitoring internal quality assurance as well as internal quality assurance policies are applied

C.1.1.1. The "Constantin Belea" Doctoral School conducts an internal quality assessment and assurance process in accordance with the IOSUD procedure

Criterion: the doctoral school to which the field of the doctoral programme belongs can prove the steady development of the process of evaluation and internal quality assurance in accordance with a procedure developed and applied at the IOSUD level, with several mandatory criteria.

The functioning of the quality assurance system in IOSUD-University of Craiova and at the level of the "Constantin Belea" Doctoral School is presented in full detail in Section 1.3 of the current Self-Evaluation Report. The quality evaluation and assurance procedures are applied in accordance with *the Rector's Statement on the Quality Assurance Policy of the University of Craiova* (**Annex 1.3.1**), and the objectives pursued in the field of quality management are contained in the *Quality Assurance Code of the University* (**Annex 1.3.2**).

IOSUD has developed and periodically applies a procedure for the internal evaluation and monitoring of the doctoral schools and doctoral fields. The IOSUD Guide for the procedure for periodic evaluation and internal monitoring of Doctoral Schools is presented in **Annex C.1.1.1 1**. For the SE Doctoral School, the Self-Evaluation Report contains a separate chapter. For example, the 2016 Self-Evaluation Report of the Doctoral School in the Systems Engineering field is presented in **Annex C.1.1.1 2a** and the 2019 Self-Evaluation Report of the Doctoral School in the SE field is presented in **Annex C.1.1.1 2b**. Additional elements are presented in Section 1.1 of the Self-Evaluation Report.

Among the criteria considered in these periodic reports, we mention:

a) the scientific performance of the Doctoral supervisors

b) the infrastructure and facilities required to carry out the research activities;

c) the procedures and norms on the basis of which the doctoral programme is organised;

d) the scientific performance of the doctoral students;

e) the training programme based on advanced academic studies of the PhD students;

f) social and academic support services (including participation in various events, publication of papers) and scientific advice provided to Doctoral students.

**C.1.1.2. Feedback mechanisms from Doctoral students to identify their needs and their level of satisfaction*

Criterion: during the doctoral programme, student feedback mechanisms are implemented so as to identify the PhD candidates' needs, as well as their general level of satisfaction with the doctoral programme, with a view to continuously improve the academic and administrative processes. Following the analysis of the results obtained, we highlight the development and implementation of a plan of measures.

The fulfilment of this criterion is available by accessing the link: https://chestionar.ucv.ro/. **Annex C.1.1.2 1** shows the questionnaire on the satisfaction of Doctoral students with the doctoral programme and a guide to fill in this questionnaire.

According to the surveys carried out among the SDCB students (*PhD students feedback questionnaire on the satisfaction level with the Doctoral School and the doctoral programme* – **Annex_C.1.1.2_1**) in the academic year 2019-2020. Our Doctoral candidates expressed a high degree of satisfaction concerning the criteria relating to the database and laboratory access, as well as the criteria relating to the support provided for the attendance of scientific events (the questionnaire contains a total of 10 quality criteria), see the full statistical results in **Annex_C.1.1.2_2a**. Statistics on criteria C4 and C8 in the questionnaire were presented in Section B.2.1.4. Figure C.1.1 illustrates statistics on the C3 criteria (*Does the training programme facilitate advanced knowledge in the field of research methodology, statistical data processing, as well as ethics and academic integrity*?) and C5 (*Does access to databases, laboratories and libraries, subscriptions to journals ensure the effectiveness of the doctoral research*?). Also, a high degree of satisfaction was recorded in relation to the year 2020-2021, according to the survey conducted among Doctoral students in the Doctoral Field of Systems Engineering (participation in the survey: 71.42%) - see full results in **Annex_C.1.1.2_2b**. Figure C.1.2 exemplifies some of the statistical data. The feedback indicate that the students selected the *Excellent* rating - more than 80% (except for criterion C2 - 60% and Criterion C3 - 70%). Also, for all criteria, the rates recorded are: *Excellent, Very good* or *Good*.

Following the interpretation of Doctoral students feedback further support measures were implemented in the period 2016-2020 (for example, considering the feedback provided in 2016-2017: efforts were made to implement private grants schemes, such as QforIT – **Annex_A.1.3.2_1**). Also, following the analysis of the 2019 survey, in order to meet the Doctoral students requests for the implementation of scholarship schemes (insufficient budgeted places), and in order to increase the applicability of the research outcomes, a POCU project was implemented: "The Entrepreneurial University - Higher Education and Training System for the Romanian labour market by granting scholarships for Doctoral students and postdoctoral researchers and implementing innovative entrepreneurial training programmes", POCU/380/6/13/123990, 2019-2022, budget 6,173,828.15 lei (**Annex_A.1.3.2_2**). Three PhD students in the field of Systems Engineering participate in this project: Gheorghe Bujgoi, Codrin Tiberiu Mustățea and Mădălin Lucian Mămuleanu.

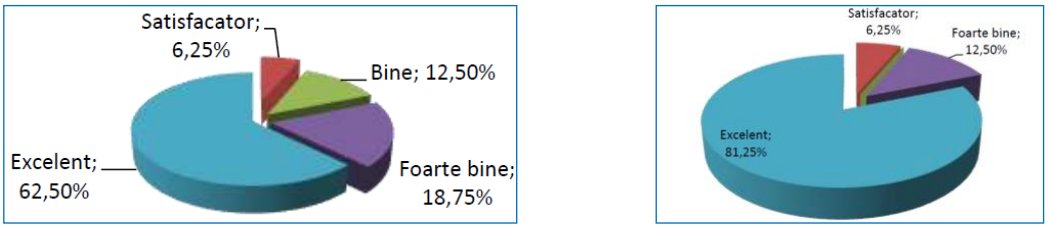

Figure C.1.1. Survey data interpretation - criteria C3 (left) and C5 (right), SDCB Doctoral students, 2019-2020

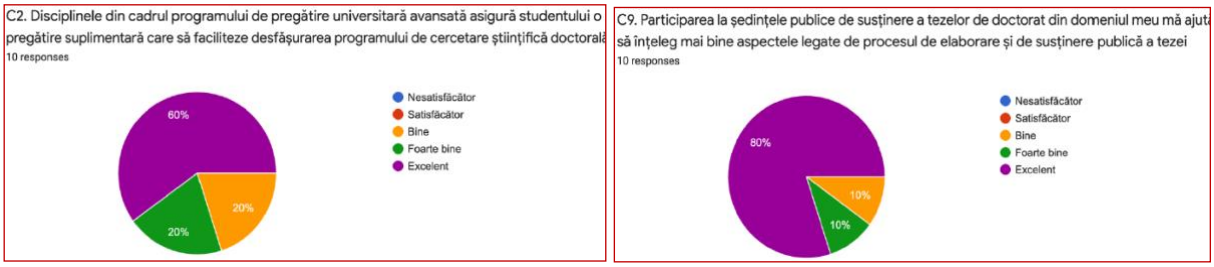

Figure C.1.2. Survey results criteria C2 and C9 - SE Doctoral students, 2020-2021

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

C.2.1. Information of public interest for Doctoral students and prospective candidates is available for consultation in electronic format

C.2.1.1. Publication of information by IOSUD on the website of the higher education institution, in compliance with the regulations in force on data protection

Criterion: The doctoral school, through IOSUD, shall post useful information on the website of the organising institution, in compliance with the general regulations on data protection.

IOSUD - University of Craiova, as well as the "Constantin Belea" Doctoral School posts information on the official web pages, in compliance with the regulations in force on data protection, as presented below:

a) IOSUD Regulation:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/reglementari.php

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/admitere/2021/Regulament_studii_doctorale_si_postoctorale_2021.pdf

and the Regulation on the Organization, Functioning and Internal Quality Assurance at the level of the "Constantin Belea" Doctoral School:

http://ace.ucv.ro/sdcb/files/regulament_SDCB.pdf

b) the admission procedure:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/admitere_informatii.php

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/admitere/informatii/2020/Regulament_organiz_si_desf_concurs_de_admitere_2020_2021_v1.pdf

c) the doctoral study contract:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/admitere_contracte_studiu.php

d) the regulations for the successful completion of the doctoral programme, including the procedure for the public defence of the thesis are presented in the IOSUD Regulation – Chapter VI. Doctoral thesis and completion of doctoral studies:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/reglementari.php

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/admitere/2021/Regulament_studii_doctorale_si_postoctorale_2021.pdf

To secure the quick access of Doctoral candidates, an excerpt from Chapter 6 that refers to the programme completion and public defence of the doctoral thesis is available:

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/admitere/2021/Regulament_studii_doctorale_si_postoctorale_2021.pdf

In the Covid-19 context, a procedure for the online defence of doctoral theses was approved and is implemented:

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/informatii/II_Proceduri_sustinere_teza_de_doctorat_on_line.pdf

e) the content of the training programmes based on advanced university studies – is enclosed in the curriculum of the "Constantin Belea" Doctoral School:

http://ace.ucv.ro/sdcb/files/PlanDeInvatamantSDCtinBelea2020-2021.pdf

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

The list of PhD supervisors in all fields of the IOSUD-UCv is available on the website of IOSUD:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/lista_conducatori_doctorat.php

A Presentation Guidebook of the Doctoral supervisors of IOSUD and relevant information on their academic and scientific background, thematic areas/research topics is available on the IOSUD - UCv official website:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/prezentare_IOSUD.php

Research topics are also posted during the admission sessions:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/admitere_teme_propuse.php

Specific information about the PhD supervisors is also available on the web page of the "Constantin Belea" Doctoral School:

http://ace.ucv.ro/sdcb/organizare.html

g) the list of doctoral students in the field, and basic information (enrolment year; PhD supervisor) is available on the website of the "Constantin Belea" Doctoral School:

http://ace.ucv.ro/sdcb/doctoranzi.html

h) information about the standards for writing the doctoral thesis.

Information on the writing of the doctoral thesis is specified in Chapter 6 of the IOSUD Regulation:

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/informatii/regulamentari/Pages_from_Regulament_studii_doctorale_si_postoctorale_2021.pdf ,

as well as in the Regulation on the organization, functioning and internal quality assurance at the level of the "Constantin Belea "Doctoral School (Art. 10),

http://ace.ucv.ro/sdcb/files/procedura_elaborare_teza.pdf .

i) links to the abstracts of the doctoral theses to be defended, as well as the date, time, place where they will be defended, at least 20 days prior to their defence. This information is posted on the official website of IOSUD-UCv:

https://www.ucv.ro/invatamant/educatie/programe_doctorat/programate.php

In conclusion, the Doctoral School of Systems Engineering and IOSUD-UCv publishes on the official websites of the University of Craiova relevant information for PhD candidates and PhD supervisors (**Annex_C.2.1.1**).

C.2.2. IOSUD / the doctoral school grants the doctoral students access to the resources required to successfully complete the doctoral programme

C.2.2.1. All doctoral students are granted free access to a platform with relevant academic databases in the field of Systems Engineering

All Doctoral students and post-graduates from the University of Craiova have free access to the academic databases, including in the field of Engineering Systems, such as 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), etc., via the platform provided by the Association of Universities, Research and Development Institutes and Central University Libraries of Romania (http://biblio.central.ucv.ro/bib_web/ro/Anelis_Plus.php) – see further details in section A.2. of the Report.

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

To check the content of scientific papers and doctoral theses, the University of Craiova has acquired an electronic system for verifying the degree of similarity with other existing scientific or artistic creations, a system to which all Doctoral students have access, upon request (www.sistemantiplagiat.ro). Details of the description of the software, the user guide and tutorial are provided in Section A.1.2.2 (See also **Annex_A.1.2.2**).

C.2.2.3. All Doctoral students in the field of Systems Engineering have access to scientific research laboratories or other facilities

Our PhD students have access to the following laboratories, library and other research facilities specific to the field of System Engineering, both on-site and via online platforms as previously mentioned (see please Section A.2.1.1 and **Annex_A.2.1.1_1**, **Annex_A.2.1.1_2**, **Annex_A.2.1.1_4**):

- The Library of the University of Craiova (reading rooms, book stores, including online access)
- The "Industrial Process Control" Laboratory " – CPI (Continental)
- "Hella Embedded Club" and "Programming and Numerical Simulation" Laboratories
- The "Engineering and Computer Aided Design" Laboratory - IPA
- The "Hydraulic and Pneumatic Systems" Laboratory - SHP
- The "Control Systems and Equipment" Laboratory - SEC
- INCESA (Research Hub of Applied Sciences): the Laboratory of Modelling, Identification and Control of Biochemical And Biotechnological Processes MICBIO, including the access to the infrastructure of the centres: CCDSC (Centre for Research in the Field of Computer Science and Engineering), CCDBB (Centre for Research in Biotechnology and Bioengineering), and CCDIE (Centre for Research in the Field of Electrical Engineering).

Also, upon the request of our doctoral students, access to the other laboratories of the University of Craiova is secured according to the specifics and needs of their research activities.

C.3. Degree of internationalisation

C.3.1. The strategy to increase the degree of internationalisation of the doctoral programmes

C.3.1.1. IOSUD agreements for the Doctoral Field of Systems Engineering

Criterion: The field of study evaluated, through IOSUD, has signed mobility agreements with universities from abroad, with research institutes, with companies that carry out activities in the field, with respect to the doctoral students and teaching staff mobility (for example, ERASMUS agreements for the doctoral studies cycle). At least 35% of PhD students have undertaken a training course abroad or another form of mobility, such as attendance of international scientific conferences. IOSUD develops and implements policies and action plans aimed at increasing the number of PhD candidates attending training courses abroad to at least 20%, which is the target at the level of the European Higher Education Area.

The Systems Engineering Doctoral Field through the "Constantin Belea" Doctoral School has concluded mobility agreements with universities and research institutes from abroad. **Annex C.3.1.1** presents a list of all ERASMUS agreements concluded at the level of the Faculty of Automation, Computers and Electronics, as well as a list of agreements relating to doctoral studies. 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
- Universidad de Malaga, Spain
- University of Genoa, Italy
- Université de Technologie de Compiègne, France
- University of Miskolc, Hungary
- University of Pardubice, Czech Republic

Doctoral students enrolled to the "Constantin Belea" Doctoral School, in the Doctoral Field of Systems Engineering, have participated in training courses abroad or in international conferences. Of the 14 Doctoral students currently enrolled (as indicated in Table B.2.1), 7 have attended international conferences or training sessions, such as (See also (See also **Annex B.3.1.1_2** with the list of publications):

- Radu-Lucian Constantinescu (Int. Carpathian Control Conference ICCC 2018, Hungary);
- Teodor-Constantin Nichițelea (Int. Conference Methods and Models in Automation and Robotics MMAR 2019, Poland; Int. Graduate School on control IGSC 2019, France);
- Geanina Unguritu (Int. Conf. Methods and Models in Automation & Robotics MMAR 2019, Poland; Int. Graduate School on Control 2019, France; IEEE Electronics 2021, Lithuania);
- Mădălin Lucian Mămuleanu (IEEE Eurasia Conf. Biomedical Eng. ECBIOS 2021, Taiwan);
- Anca Albița (Int. Conference System Theory, Control and Computing ICSTCC 2020);
- Mihai-Bebe Simion (Int. Conf. System Theory, Control and Computing ICSTCC 2020);
- Gheorghe Bujgoi (ICSTCC 2020, Int. Carpathian Control Conf. 2021, Czech Republic).

Thus, **7 of the 14 Doctoral students currently enrolled have** participated in international conferences or training sessions, i.e., a **percentage of 50%.**

If the 16 Doctoral students enrolled in the period 2015-2020 are considered, we total 8 candidates that have participated in international conferences or training sessions (to the previous list we added the PhD student Nguyen Van Dong Hai, with numerous participations in conferences – **Annex B.3.1.2**), hence, **still reaching a percentage of 50%.**

If all 23 students enrolled in the period of 2015-2021 (2 expelled) are considered, we total 11 candidates that have participated in international conferences or training sessions (to the 8 indicated above we add Bogdan Popa, Bogdan Monea și Andreea Șoimu, with frequent attendance of international conferences – **Annex B.3.1.2**), i.e., **a percentage of 47.82%.**

Corroborating the information provided above, regardless of the cohort of the Doctoral students considered, the criterion specifying that at least 35% of candidates should have completed a training programme abroad or some other scheme of mobility is met.

With regard to the mobility of Doctoral supervisors, in the period 2015-2020 we registered numerous mobilities within international conferences, as invited professors (see also **Annex A.3.2.1_3** - international visibility), as well as ERASMUS mobilities. For example, professors Dan Popescu, Dan Selișteanu and Dorin Şendrescu participated in an ERASMUS *Training Mobility* at the University of Miskolc, Hungary, May 2019 (Professor József Vásárhelyi), Professors Dan Popescu and Dan Selișteanu participated in a *Training Mobility* at Comenius University of Bratislava, Slovakia, August 2017 (Professor Zuzana Kubincová), Professor Dan Selișteanu attended an *Erasmus + workshop: Playful Coding-Learn2Code and Code2Learn*, Universitat de Girona, Spain, May 2016 (Professor Xavier Cufi), etc.

IOSUD – UCv develops and implements policies and action plans aimed at increasing the number of Doctoral students attending training courses abroad, through Erasmus+ programmes but also through other agreements (with countries from Asia and America, for example). Several other programmes dedicated to the internationalisation of doctoral studies are implemented (SEE programmes, the AUF Eugen Ionescu programme, counting 6 SDCB scholarships awarded between 2015-2020, etc.). Thus, the aim is to increase the number of Doctoral students participating in internships abroad, up to at least 20%, which is the target at the level of the European Higher Education Area. It is also envisaged the submission of ERA-MSCA Co-fund applications for doctoral and postdoctoral programmes in cooperation with foreign universities.

C.3.1.2. The organisation of joint doctoral programmes, as well as visiting schemes involving worldclass experts that deliver courses / lectures to PhD students

Criterion: Within the evaluated field of studies, the organisation of joint doctoral programmes, as well as visiting schemes involving worldclass experts that deliver courses / lectures to PhD students is supported, including financial support.

At the *International Conference on System Theory, Control and Computing* technically co-sponsored by the IEEE Control Systems Society, co-organised by the Faculty of Automation, Computers and Electronics, leading scholars in the field are invited every year to deliver lectures to the doctoral students (http://ace.ucv.ro/icstcc2020/speakers.php). Thus, numerous lectures were delivered by invited professors such as Mirjana IVANOVIC (Serbia) - "Influence of Artificial Intelligence on Personalized Medical Predictions, Interventions and Quality of Life Issues"; Igor KOTENKO (Russia) - "Intelligent Situational Awareness for Cyber Security"; Ioan-Dore LANDAU (France) - "Adaptive Youla-Kucera Parametrization for Active

Vibration and Noise Attenuation"; Ulrich RUCKERT (Germany) - "Cognitronics: Resource-efficient Architectures for Cognitive Systems".

Special scientific sessions are also organized for Doctoral students and young researchers - for instance, at ICSTCC 2020, organized by our faculty, the *Round Table: Young Researchers Meetup in Control Engineering and Computer Science* was organised: https://controls.papercept.net/conferences/conferences/STCC20/program/STCC20_ProgramAtAGlanceWeb.html.

In 2020, the organization and financing of a special workshop dedicated to the doctoral students of the "Constantin Belea" Doctoral School was initiated: *1st International Doctoral Workshop on Advanced Approaches in Robotics, Control and Computing – A^2RC^2*, initially scheduled for March-April 2020, but postponed due to the pandemic, to be reorganized in 2021. Prominent specialists have been invited to deliver lectures, such as: Andrzej BARTOSZEWICZ (Institute of Automatic Control, Lodz University of Technology, Poland), Paolo MERCORELLI (Control and Drive Systems Unit, Leuphana University of Lüneburg, Germany), Sorin Olaru (CNRS Laboratory of Signals and Systems, CentraleSupélec, France), Ramon VILANOVA I ARBOS (Department of Telecommunication and Systems Engineering, Autonomous University of Barcelona, Spain) – **Annex_C.3.1.2**.

Regarding the organisation of joint doctoral programmes, following the public defence of the doctoral thesis within a joint doctoral programme: *Adaptive dynamic hypermedia systems for e-learning*, the Doctoral student Popescu Elvira (University of Craiova and Technological University of Compiègne, France; Doctoral supervisors Professor Eng. Vladimir Răsvan and Professor Trigano Philippe), the Doctoral Field of Systems Engineering, 2008, we aim to stimulate this system by inviting prestigious professors from abroad to deliver lectures and join our doctoral programmes. The initiative is facilitated by the participation of Doctoral supervisors from the field of Systems Engineering in thesis defence committees abroad (**Annex_A.3.2.1_3**).

C.3.1.3. Internationalisation of doctoral studies activities via other concrete measures

In order to improve the quality of the research activities within the doctoral study programme and to strengthen internationalisation, a well-known specialist in the field of Systems Engineering was included in the Council of the "Constantin Belea" Doctoral School http://ace.ucv.ro/sdcb/organizare.html: Professor Silviu NICULESCU, L2S-Centralesupelec, France, https://l2s.centralesupelec.fr/u/niculescu-silviu-iulian/.

Also, we aim to increase the number of foreign PhD students in Systems Engineering. In 2018, Nguyen Van Dong Hai, from Vietnam (Doctoral supervisor - Professor Eng. Mircea Ivănescu) defended his thesis (confirmed by CNATDCU), see Table B.3.1, Section B.3.1.1.

One of the directions of promoting internationalisation is to implement new Erasmus + contracts and projects, according to the examples provided in section C.3.1.1, thus thematic events will be organised, and foreign specialists will be invited to become members of the Advisory committees.

Another measure to intensify internationalisation is the attraction of part-time researchers at our university, from traditional university centres abroad, thus securing a better dynamics of the Doctoral School.

3. Strategies and procedures implemented in the field of doctoral studies

At the level of the field of Systems Engineering and the „Constantin Belea" Doctoral School within IOSUD - University of Craiova, a series of additional measures have been initiated to improve the quality of doctoral programmes, other than those provided for by the minimum standards, regulated by Annex no. 2 of Order No. 3651 of 2021, via the strategic approaches and procedures described below.

3.1. Alternative procedures for evaluating the scientific research activity

At the level of IOSUD – University of Craiova, alternative procedures were established in 2020 *for the evaluation of the doctoral scientific research activity of students enrolled, until the public defence of the doctoral thesis and the approval of the doctoral thesis defence committees* (**Annex 3.1**):

https://www.ucv.ro/pdf/invatamant/educatie/programe_doctorat/informatii/I_Proceduri_de_evaluare_a_activitatii_de_cercetare_st_doctorala.pdf

These procedures, also applicable in the field of Systems Engineering, are provided to ensure the smooth conduct of doctoral studies during periods related to states of lockdown and alert caused by the Covid-19 pandemic.

3.2. Collaboration with economic partners for research and doctoral programmes

In order to improve the quality of the programme in the field of Systems Engineering, as well as to increase the applicability of the research outcomes in different industrial sectors, steps have been taken to the strategic strengthening of the cooperation with the partners of the Faculty of Automation, Computers and Electronics, focusing on specific activities in the field of Systems Engineering (automotive industry, aerospace industry, etc.), such as: Continental Automotive Sibiu, Hella Craiova, CS România, QFort / Casa Noastră and other companies. It is worth mentioning that the employees of some of these companies are PhD students in the field of Systems Engineering at the University of Craiova.

The QforIT private grants system (described in Section A1, **Annex A.1.3.2_1** - QforIT Grants) will continue so as to achieve the closest link between doctoral study programmes and the industry.

In 2020, collaboration agreements were signed/extended by the University of Craiova and the Faculty of Automation, Computers and Electronics with strategic partners (**Annex 3.2**), and special attention was paid to research activities and doctoral programmes. For example, the Partnership Agreement concluded with Continental Automotive Sibiu provides collaboration procedures in the doctoral field, such as:

- design of specific doctoral research programmes at the beginning of each academic year;
- establishment of doctoral research topics of technical and scientific interest, by mutual agreement between the management of Continental Automotive and the PhD supervisors;

- regular dissemination of the by Doctoral students' research contributions among specialists from Continental;
- support provided by Continental (within the established collaboration framework) for the dissemination of the doctoral research outcomes via conferences and publications in prestigious journals;
- publication of scientific papers co-authored by Doctoral Students employed by Continental;
- patenting of common research results through amicable negotiation on a mutually beneficial basis.

3.3. Collaboration with national research institutes for research and doctoral programs

Another direction of action to improve the quality of the doctoral programme in the field of Systems Engineering is the collaboration with research institutes with a view to the development of projects based on the research activities carried out by the members of the Doctoral School. Thus, we focus on cooperation with the research institutes as well-established partners of the team of the Doctoral School in Systems Engineering, such as the *National Institute for Research and Development and Testing for Electrical Engineering (ICMET)* Craiova, *the National Research and Development Institute for Cryogenic and Isotopic Technologies (ICSI)* Rm. Vâlcea, etc. Also, we mention the research project in partnership between the University of Craiova and ICMET: *Numerical and hybrid control techniques of converters for adjustable drives*, University of Craiova, PCCA 161, 2012-2016, 2,030,893 lei, director Professor Vladimir Răsvan (Doctoral supervisor in SE at the time), members Dan Popescu, Eugen Bobașu, etc. In 2020, a researcher from ICSI Rm. Vâlcea completed his doctoral studies in the field of Systems Engineering, and currently a researcher from ICMET Craiova is a Doctoral student in the field of Systems Engineering.

Moreover, the strategy of the institution is to conclude new agreements with highly ranked research institutes, such an agreement was concluded in 2020 with *the National Institute for Research & Development in Informatics (ICI) Bucharest,* (**Annex 3.3**). The main objectives target the identification of new areas of smart specialization, participation in grant-funded programmes, the organisation of joint conferences, and scientific cooperation with a view to establishing cooperation with universities in the country and abroad for the promotion and implementation of study programmes and research projects, etc. In this context, ICI invited members of the academic community and especially members of the Doctoral School to contribute to the publication of the research outcomes in prestigious journals in the field of Systems Engineering, edited by ICI Bucharest (**Annex 3.4**): *Studies in Informatics and Control* (ISI, Q2) and the *Romanian Journal of Informatics and Automation* (Emerging Source Citation Index - ISI).

3.4. Workshops, doctoral symposia and dedicated publications

In order to increase the performance of the Doctoral students in the field of Systems Engineering, we aim to improve the training of doctoral students by their participation in

events such as workshops and seminars. Thus, in addition to the internationalisation measures already presented in Section C3, the following actions are implemented:

- Based on the 2020 good practices with the annual organization at the *International Conference on System Theory, Control and Computing ICSTCC* (technically co-sponsored by IEEE Control Systems Society and co-organized by the Faculty of Automation, Computers and Electronics), of a workshop dedicated to doctoral students and young researchers.

- Organisation of symposia and workshops with companies in the field, to disseminate the scientific results of our doctoral students. A symposium was organized by the Faculty of Automation, Computers and Electronics jointly with the "Constantin Belea" Doctoral School in 2018, in partnership with companies such as QFort/Casa Noastră, IT companies and other field-related companies and services (QForIT-FACE Symposium – **Annex 3.5**). During the Symposium, research projects of Doctoral and post-doctoral students (including in the field of Systems Engineering) were presented so as to evaluate the degree of innovation and to identify ideas for possible start-ups.

- Organisation of special sessions for Doctoral students in Systems Engineering within the scientific conferences of the Department of Automation and Electronics. In this context, Doctoral students can present some of the achievements for further discussion in a broader framework than within the Doctoral School.

- Publication of Doctoral students ' research findings in dedicated journals:

Accordingly, the aim is to publish their works in *Journal of Young Researchers*, edited by UCv, (https://www.ucv.ro/cercetare/programe_de_cercetare/jyr.php).

Moreover, dedicated issues for the Doctoral students of the "Constantin Belea" Doctoral School (including the field of Systems Engineering) of the journal *System Theory, Control and Computing Journal*, http://stccj.ucv.ro/index.php/stccj will be published. The Journal has been recently established, in collaboration with prominent academic partners of the Faculty of Automation, Computers and Electronics. A similar, long-lasting cooperation has been established for the organisation of the prestigious ICSTCC conference (with universities in Timișoara, Iași, Galați and Cluj-Napoca).

4. Additional Information

4.1. SWOT Analysis

The self-evaluation report provides an overview of the ***doctoral study programme in the field of Systems Engineering***, enjoying a well-established tradition and high relevance, which follows ARACIS strategy and methodologies, as well as the Regulations of the "Constantin Belea" Doctoral School and IOSUD – University of Craiova, securing adequate doctoral training.

Strengths

- Extensive experience in the field of doctoral studies, enjoying a well-established tradition of over 45 years since the first graduates and continuity of over 25 years for the full cycle of Bachelor's-Master's-Doctoral programmes.
- The field of doctoral studies defines a modern research direction, which is highly topical at the national and international level.
- The field of doctoral studies trains highly qualified professionals who are on demand in higher education, research institutes and specialized RDI departments.
- Integration of both experienced and young Doctoral supervisors in several specialisations and having international visibility.
- Highly trained Doctoral students with research outcomes in high impact publications; the dropout rate being low.
- State-of-the-art research resources, equipment, laboratories, library and international databases, as well as the INCESA infrastructure, which facilitates access to valuable research contracts.
- Visibility of the doctoral field ensured also by the co-organisation of the ICSTCC conference, accredited internationally (Control Systems Society – IEEE).
- Development of collaboration with powerful companies in the field (with respect to Doctoral students, laboratory equipment and infrastructure).
- Provision of additional incentives for competitive Doctoral students (QforIT scholarship system, POCU scholarships).

Weaknesses

- Seeking habilitation and affiliation with the Doctoral school is hindered by tougher minimum standards as compared to other fields of engineering.
- Lack of international joint doctoral programmes (although collaboration is established).
- Part of faculty/doctoral school's infrastructure is currently being rehabilitated.

Opportunities

- National and European policies regarding the development of systems engineering (automation, IT, and connected fields) as a priority.
- Completion of the campus rehabilitation (via a POR project) which will grant access to state-of-the-art teaching facilities.
- Increasing openness towards the industry, especially in the automotive and connected fields.

Threats

- Competition from similar doctoral programmes at the national and European levels.
- Lower interest of young people in the technical doctoral field in conjunction with higher living standards and costs and with the impact of the pandemic.
- Decrease of national financing for research, affecting both the supervisors and Doctoral students.

4.2. Conclusions

The Doctoral Field of Systems Engineering of the "Constantin Belea" Doctoral School of IOSUD University of Craiova currently comprises 5 Doctoral supervisors.

All 5 Doctoral supervisors are full-time teaching staff members and meet the CNATDCU minimum standards in force at the date of evaluation, required and mandatory for the award of the habilitation certificate, totalling higher scores than the CNATDCU requirements. In the last 5 years, all 5 Doctoral supervisors have achieved scores higher than 25% of the score required by the CNATDCU minimum standards in force and prove high international visibility. In the same period, at the level of the Doctoral School in the field of Systems Engineering, numerous research grants in Systems Engineering were developed and implemented by the Doctoral supervisors.

The research infrastructure of the Doctoral School is adequately sized, also benefiting from a university library providing extensive bibliographic resources, including online databases, and the support of a modern Applied Sciences Hub, INCESA.

In the last 5 years, 11 Doctoral students were enrolled in the doctoral programme in the field of Systems Engineering, and 5 enrolled in the academic year 2020-2021. Of these, 2 Doctoral students have defended their doctoral theses (validated by the CNATDCU and by Order of the Minister), and 14 are in progress (one doctoral student undertakes programme extension). Of the 7 Doctoral students enrolled before 2015, 5 completed their theses (validated by CNATDCU and by Order of the Minister). Graduates of this period, as well as current Doctoral students, authored a series of scientific papers published in ISI and IDB listed journals and participated in numerous international scientific events.

In the conclusion of the current Self-Evaluation Report for the period 2015-2020, we highlight that **the Doctoral Field of Engineering Systems of the "Constantin Belea" School**, Faculty of Automation, Computers and Electronics, IOSUD - University of Craiova, meets the key performance indicators included in the evaluation of doctoral studies, as of Order no. 3651/2021.

5. Annexes

Annex_1.1.1	Decision of the Rector of the University of Craiova (UCv) concerning the establishment of the Doctoral School of Engineering Sciences - 2012
Annex_1.1.2	Establishment of "Constantin Belea Doctoral School" (SDCB) documents - 2015 (a) Excerpt of the decision of the UCv Senate (b) Decision of the Senate of the University of Craiova and annexes (c) IOSUD Structure
Annex_1.1.3	MENCS Order no. 5382/2016 - functioning of IOSUD - UCv / "Constantin Belea Doctoral School"
Annex_1.1.4	Internal Regulation on the Organization, Operation, and Quality Assurance of the Doctoral School "Constantin Belea"
Annex_1.1.5	Annual evaluation reports of SDCB (2016-2019)
Annex_1.1.6	Certificates of accreditation for the research centers: (a) ANSO; (b) DAM
Annex_1.2	(a) CSD meeting minute – approval of the Self-evaluation report of Systems Engineering Doctoral Field (SE) (b) IOSUD-CSUD meeting minute - approval of the Self-evaluation report of SE (c) Decision of the Senate of UCv - approval of the Self-evaluation report of SE
Annex_1.2.1_1	University of Craiova Charter
Annex_1.2.1_2	Strategic Plan for the development of the Faculty of Automation, Computers and Electronics, 2020-2024
Annex_1.2.2_1	Research Plan, Faculty of Automation, Computers and Electronics, 2020-2024
Annex_1.2.2_2	Research Plan of the Department of Automation and Electronics, 2020-2024
Annex_1.2.4	Evolution of the number of Doctoral students enrolled in the Doctoral field of Systems Engineering
Annex_1.2.5	Description of the ANSI laboratory (research approaches, members, infrastructure, scientific achievements, certificates)
Annex_1.3.1	Quality Policy Statement of the Rector of the University of Craiova
Annex_1.3.2	Quality Assurance Code of the University of Craiova
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Annex_1.3.4	Strategic Plan of the Department of Quality Management, 2020-2024
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Annex_1.3.6	Evaluation and Quality Assurance Commission and the Assurance Quality Council of UCv
Annex_1.3.7	University of Craiova Code of Ethics
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