Agentur für
Qualitätssicherung
und Akkreditierung
Austria

Expert report on the accreditation procedure for the doctoral programme in "Network Science" conducted in Vienna by the Central European University Private University

pursuant to § 7 of the Accreditation Regulation for Private Universities 2019 (PU-AkkVO)

Vienna, 27.05.2020

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1   Basic principles for the procedure

The Austrian higher education system

To date, the Austrian higher education system comprises:

- 22 public universities; including the Danube University Krems, a public university for post-graduate continuing education;
- 16 private universities, run by nationally accredited private entities;
- 21 universities of applied sciences, run by state-subsidised entities organised under private law or by nationally accredited public entities;
- the university colleges of teacher education, run by nationally accredited public or private entities;
- the philosophical-theological higher education institutions, run by the Catholic Church;
- the Institute of Science and Technology – Austria, which focusses its tasks on the advancement and appreciation of new fields of research and a post-graduate training in the form of PhD and postdoc programmes.

In the winter semester of 2018/2019, 293,644 students were enrolled at public universities (incl. the Danube University Krems). Furthermore, 53,401 students were enrolled at universities of applied sciences and 14,446 students at private universities.[1]

External quality assurance

Pursuant to the Act on Quality Assurance in Higher Education (HS-QSG), public universities shall perform an audit procedure for the certification of their internal quality management system every seven years. There are no legal or financial consequences linked to the decision on certification.

Private universities require institutional accreditation conducted by AQ Austria every six years. After twelve years of uninterrupted accreditation, the accreditation may also be awarded for twelve years. Interim degree programmes and certificate university programmes for further education leading to a degree programme also require accreditation.

Following the six-year period of institutional initial accreditation, universities of applied sciences must be re-accredited. After that, they pass on to the audit system. However, the accreditation is linked to a positive decision on certification in the audit procedure. Before degree programmes may be offered, they must be accredited once.

Accreditation of private universities and their degree programmes

In order to be active as a higher education institution in Austria, private universities require institutional accreditation which must be renewed on a regular basis. In addition to institutional accreditation, newly established degree programmes must be accredited once before they may

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[1] As at May 2019, data source: Statistics Austria/unidata. Contrary to the data of the public universities, the student numbers of the universities of applied sciences do not include non-degree seeking students. 278,039 degree students were enrolled at the public universities in the winter semester 2018/19.

be offered by the private university. The Agency of Quality Assurance and Accreditation Austria (AQ Austria) is responsible for carrying out accreditation procedures.

The accreditation procedures are carried out in accordance with AQ Austria's Accreditation Regulation for Private Universities 2019 (PU-AkkVO). Furthermore, the agency has based its procedures on the Standards and Guidelines for Quality Assurance in the European Higher Education Area.[2]

The AQ Austria appoints experts for reviewing accreditation applications. On the basis of the application documents and a site visit at the applicant institution, the experts draw up a joint written expert report. The Board of the AQ Austria then makes a decision on accreditation which is based on the expert report and takes into consideration the higher education institution's comment on the expert report. If the statutory prerequisites for accreditation are met and the required qualitative requirements are fulfilled, the degree programmes shall be accredited by official notification.

Before its entry into force, the official notification of the Board shall be subject to approval by the competent Federal Minister. After the procedure has been completed, a report on the outcome of the accreditation procedure as well as the expert report shall be published on the websites of AQ Austria and the applicant institution. Personal data and those parts of the report that disclose funding sources as well as business and operational secrets shall be exempt from publication.

The Act on Quality Assurance in Higher Education (HS-QSG) and the Private Universities Act (PUG) form the legal basis for the accreditation of degree programmes at private universities.

2 Short information on the accreditation procedure

Information on the applicant institution	
Applicant institution	Central European University Private University (CEU PU)
Legal nature	GmbH
Initial accreditation	16/07/2019
Last extension of accreditation	-
Site/s	Vienna
Number of students	ca. 1800 planned
Information on the accreditation application	
Name of the degree programme	PhD in Network Science
Type of the degree programme	Doctoral programme
ECTS credits	240
Normal period of studies	4 academic years, 12 terms
Number of study places	5-6

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[2] Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)

Academic degree	Doctor of Philosophy (PhD)
Organisational form	Full-time
Language/s used	English
Site at which the degree programme is offered	Vienna
Tuition fees	Fully funded with scholarship

The Central European University Private University submitted the application for accreditation on 09.01.2020. In its decision on 20.02.2020, the Board of AQ Austria appointed the following experts for the review of the accreditation application:

Name	Institution	Role assumed in the expert panel
Ulrik **Brandes**	ETH Zurich	Chairing expert with scientific qualification
Matteo **Magnani**	Uppsala University	Expert with scientific qualification
Claudia **Wagner**	University of Koblenz-Landau GESIS - Leibniz Institute for the Social Sciences	Expert with scientific qualification and relevant work experience
Meike **Will**	Helmholtz Centre for Environmental Research – UFZ	Student expert

3 Preliminary notes of the experts

This report is based on written documentation submitted by the Central European University Private University on 09.01.2020 in the version of 24.02.2020 and additional documentation provided on 14.04.2020 upon request of the expert panel. Due to travel and meeting restrictions during the SARS-CoV-2 pandemic, it was not possible to perform the site visit that was planned for April 17, 2020 at CEU PU's campus in Vienna. To compensate for the site visit, separate online meetings with core faculty and current doctoral students were arranged for the originally scheduled date. Furthermore, the expert panel received additional information, including video statements on general institutional issues, a campus map, floor plans, and a space allocation plan. The experts are confident that the outcome of the procedure was not affected by these circumstances.

The experts also note that the doctoral programme is already in operation since 2015 and is approved by as well as registered with The State Education Department of New York. Moving the CEU PU campus to Vienna, where the 2020 cohort is expected to begin the programme, necessitates a new accreditation in Austria.

4 Review and assessment based on the assessment criteria stipulated in the PU-AkkVO

4.1 Assessment criterion § 18 (1) 1 to 2: Development and quality assurance of the doctoral programme

Development and quality assurance of the degree programme
1. The degree programme was developed using a predefined procedure for the development and establishment of degree programmes and involving the relevant stakeholder groups.

In the application documents, CEU PU included a policy document on establishing degree programmes. The document describes the procedure used to establish all new degree programmes at the private university, including the PhD programme in Network Science. The procedure includes an initial evaluation by the Provost and the Rector, presentations to the Academic Forum and Senate, recommendations provided by the Senate Curriculum and Academic Quality Assurance Committee, followed by the Senate's approval and national accreditation. The document also includes a description of the information that must be included in a programme proposal. The expert panel reviewed the application documents at hand as evidence of this procedure.

The experts would like to point out that in addition, the programme director published an article providing an overview and general evaluation of the PhD programme, see Kertész J., Vedres B. (2018) Europe's First PhD Program in Network Science. In: Cramer C., Porter M., Sayama H., Sheetz L., Uzzo S. (eds) *Network Science In Education*. Springer, Cham.

In the virtual session, CEU PU indicated three main groups of stakeholders: academic societies related to Network Science, a consulting company, and other departments at CEU PU. While the representativeness of industrial stakeholders consulted during the development of the programme proposal was limited, the Department of Network and Data Science's representatives mentioned several additional connections to the industry during the virtual session. Students are encouraged to do industrial internships and topics of PhD projects are sometimes chosen with relevance to industry (for example, a project on gender inequality in workplaces). Some former students have started a career in industry and some projects use data from industrial partners, e.g., mobile phone companies. During the virtual session, a plan to establish an advisory board including representatives from industry was also mentioned.

Based on this evidence, the experts consider the criterion to be **fulfilled**.

Recommendation:

(1) The expert panel recommends establishing more formal processes to gather and document feedback from academia, industry and society. The panel recommends establishing a process to keep track of the placement and the working situation of former students. The expert panel supports the plan to establish an advisory board as a way to obtain feedback from industry.

Development and quality assurance of the degree programme
2. Following its accreditation, the degree programme is incorporated into the private university's quality management system. The quality assurance measures also comprise adequate structures and procedures to ensure that the rules of good scientific practice are adhered to.

In the application documents, CEU PU described several quality assurance procedures, including the following:

- yearly evaluations of the PhD students by the Doctoral Committee,
- substantive strategic reviews of the academic units every four years by an ad hoc international review board,
- a comprehensive exam before a candidate becomes a doctoral student,
- student course evaluations for all courses,
- yearly Individual Academic Activity Reports by the teaching staff,
- course reviews by the unit head,
- evaluations of the performance of the faculty members with respect to research, teaching and service to the community.

CEU PU has also provided several university-level documents describing different aspects of the private university's quality management system: Institutional Assessment and Quality Assurance Policy, Institutional Assessment and Quality Assurance Handbook, and Doctoral Regulations. Following a request from the expert panel, CEU PU provided additional documents with a summary of course evaluations and of supervision activities for the last two academic years, indicating a very high overall student satisfaction.

In the virtual meeting, CEU PU listed several rules of good scientific practice that are touched upon in different courses, for example regarding issues of research integrity, importance of rigor, honesty and openness in research, behaviour if misconduct is experienced, respectfulness to colleagues, and accountability of funders. These rules are transmitted in the interactions with the students. In the virtual meeting, the students were aware, which research projects require approval from the ethics committee. However, in the course evaluations, the question "I received appropriate training in research ethics" scores lower than most of the other questions. Furthermore, training in good scientific practice is only sparsely mentioned in the course syllabi, e.g. in a learning outcome in Digital Data Collection Methods and a few other learning outcomes that can be interpreted as being related to good scientific practice.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(2) The expert panel recommends adding specific Intended Learning Outcomes on good scientific practice to appropriate course syllabi, and to explicate the corresponding methods of assessment. To evaluate the effects of this change, the expert panel recommends looking at the impact on course evaluations in the following years.

Best practise

The expert panel designates the comprehensive exam as an example of best practice.

4.2 Assessment criterion § 18 (2) 1 to 6: Research environment

Research environment
1. The private university has developed a research concept which incorporates the doctoral degree programme, and a development plan, which comprises enhancement measures for the degree programme.

In the research development plan submitted by CEU PU, the private university emphasizes the aim to strengthen research in the social sciences and humanities, which coincides with one of the main research areas of the doctoral degree programme. As a methodology, network science is increasingly recognised as relevant for these and other areas of scientific inquiry. Elective courses bind the programme to other research areas present in the institution and the possibility to get credits for network science courses in other degree programmes makes that exchange bidirectional. During the online interviews, the panel learned that courses of the programme are taken by a matching number of students from other programmes. The programme proposal outlines the diverse research environment both within the Department of Network and Data Science and at CEU PU.

The experts consider the criterion to be **fulfilled**.

Research environment
2. The private university has defined a research focus for the degree programme which covers the broadness of the respective discipline as regards content and methods. The focus of the research performance corresponds to the university's approach as well as to the respective subject culture and guarantees international visibility.

Network science provides a methodology for the study of network phenomena in a broad range of disciplines. The degree programme is designed around this methodology, with a broad coverage of mathematical and computational methods such as processes on networks, mesoscopic structures, network measurement and reconstruction, temporal networks, multi-layer networks, and higher order models of networks. In addition, the application of the aforementioned methods to a wide range of problems in science and society is considered.

Students can specialise in a particular field of research/knowledge by selecting optional courses and the topic of their thesis accordingly. According to the current curriculum and past and present thesis topics, these include financial networks, psychological or knowledge networks, networks in political science, urban infrastructural networks, and social networks. The expert panel is of the opinion that the degree programme's research performance fits in well with the respective subject culture of Network Science.

Due to the possible application of its methodology to a variety of scientific disciplines, the programme is also relevant for the overall mission of CEU PU as stated in the proposal: "promote and understand open and democratic, as opposed to closed and oligarchic social forms,"; "understand inequalities in our relations to the biological environment,"; "focus on new thinking in economics that takes methodological rigor and close focus on individual decision making to tackle questions of sustained poverty and underdevelopment, welfare costs of political favoritism and corruption, financial shocks, and market structures with strong elements of personal networking," ; "strengthen the quantitative approaches in social sciences and educate

a new generation of skilled experts and scientists who can cope with the challenges of the 21st century."

International visibility is demonstrated by several collaborative research grants, currently including the DYNASNET ERC Synergy Project, SoBigData++ H2020, an Institute Partnership via Humboldt Foundation, and the Human AI project for H2020 Flagship. The international reputation of the research staff is excellent.

The experts consider the criterion to be **fulfilled**.

Research environment
3. The private university has employed professors qualified in primary occupation in the discipline relevant for the degree programme who cover the broad range of the discipline's content and methods. Primary occupation here means working at least 50% of one's total working hours in salaried employment at the private university.

According to the application documents, six professors have their primary occupation in the Department of Network and Data Science and thus in the focal area of the degree programme. This number is higher than in most other higher education institutions in the world. The majority of the professors has a background in physics with additional expertise in programme-related areas, such as computational social science.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(3) While the strong coherence in their disciplinary background serves the faculty well, the experts strongly recommend that in the future, the recruitment of faculty members should focus on increasing disciplinary diversity. In particular, relevant areas of the social sciences should receive special attention, possibly by dual appointments with other departments.

Research environment
4. The private university maintains institutionally anchored co-operation projects in research and development or the development and appreciation of the arts which are relevant for the degree programme and adequate for the respective subject culture.

The Department of Network and Data Science is embedded in several international collaborations and consortia. Current projects are funded by EU (H2020), ERC, US Air Force, and Templeton grants. A large number of cooperation partners are involved in those projects. During the online interviews the expert panel learned, that the Department of Network and Data Science would join the Complexity Science Hub Vienna, an initiative to catalyse research on complex systems to deal with pressing challenges of the 21st century. Co-operations with other local research centres are planned.

The experts consider the criterion to be **fulfilled**.

Recommendation:

> (4) The expert panel recommends establishing a small number of formal institutional partnerships that guarantee a number of places for doctoral students seeking international research stays. Although the core faculty is well connected internationally, a regular exchange with selected institutions could strengthen the visibility of these opportunities for exchange and ease planning.

Research environment
5. *The private university promotes research and development activities by providing for appropriate organisational or structural framework conditions.*

During the online interviews, the panel learned that the exchange between members of the department and its students is organised in several structured formats. In weekly research colloquia, faculty and students or invited speakers present and discuss their current work. Furthermore, various informal meetings are organised every other week to discuss successful research papers in a journal-club format, exchange useful insights, and reflect on failures. All events are listed in a shared calendar to which both, doctoral students and faculty members, have access.

According to the application documents, CEU PU provides funding mechanisms to support research work and cover costs for equipment, data, participants, or fieldwork when external funding is not available. CEU PU also offers fully paid leaves of absence for research to all its faculty members and additional teaching waivers for faculty members with particularly ambitious and relevant research projects. The establishment of interdisciplinary connections between academic areas is enhanced by research centres and multidisciplinary teams.

The experts consider the criterion to be **fulfilled**.

Research environment
6. *The private university's research infrastructure as well as its facilities and equipment are adequate on a quantitative and a qualitative basis for operating the degree programme. In the case that the private university draws on external resources, their authorisation to use them has been contractually secured.*

According to the virtual site visit and floor plans that were discussed during the virtual meeting with CEU PU's representatives, the facilities that are available to the Department of Network and Data Science provide sufficient space for all staff, faculty, and students. Classrooms are shared with other departments and reserved via a central booking system that was already used at CEU's campus in Budapest. Staff members who have already used the facilities in Vienna gave positive feedback during the online interviews. All faculty members, including administrative staff, are located in offices close to each other.

According to the programme proposal, the department has access to two servers with high storage capacities. During the virtual meeting, the expert panel learned that this resource currently reaches its limits, but that there are plans to increase the capacity, among others, by joining the Vienna Scientific Cluster, a collaboration of several Austrian universities providing

supercomputer resources and corresponding services to their users. To manage IT infrastructure developments, a task force has been setup within the department.

Regarding the library, the book collections will be shared between the campuses in Budapest and Vienna with the aim to ensure the same breadth of content for both locations. In the experts' opinion, this is not ideal. However, given that the majority of relevant literature is rather recent and available electronically, the expert panel does not consider this problematic.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(5) The expert panel recommends that the department seeks to expand its office capacity. While space is sufficient at the current level, additional student work spaces are deemed beneficial, and the planned hiring of two new faculty will make additional rooms a requirement.

4.3 Assessment criterion § 18 (3) 1 to 3: Supervision and counselling services

Supervision and counselling services
1. The private university shall conclude agreements with the doctoral students which govern the respective rights and duties of the private university, the doctoral students and their supervisors.

According to the application documents, supervision policies and practices for the PhD programme in Network Science are in line with CEU PU Doctoral Regulations. The CEU PU Doctoral Regulations state that setting up a supervision agreement between the principal and, if applicable, the associate supervisor and the doctoral student is required. A sample of a doctoral supervision agreement is included in the annex of the application. The agreement includes personal details of the doctoral student, basic details of the dissertation, the name of the supervisor(s), and responsibilities of the doctoral student and the supervisor(s). In particular, the doctoral student is obliged to regularly report to the supervisor(s) about the progress of the dissertation. The research proposal and timetable of the dissertation project shall be annexed to the agreement. Furthermore, the frequency of consultations between doctoral student and principal supervisor and, if applicable, doctoral student and associate supervisor are defined in the agreement. Specific development measures in form of disciplinary courses, transferable skills courses and non-coursework activities are specified and shall be updated every academic year. The supervision agreement is signed by the doctoral student and the supervisor(s) and has to be approved by director of the Doctoral Program and the Doctoral Program Committee.

The experts consider the criterion to be **fulfilled**.

Supervision and counselling services
2. The private university shall enable the doctoral students to engage in an intensive dialogue with scientists or artists, respectively, by collaborating with higher education institutions and, if applicable, partners outside

> *the higher education area in Austria and abroad and promote the participation of doctoral students in national and international symposia.*

In the application documents and during the virtual meeting, CEU PU emphasised the importance of exchange with other universities, research institutes and industry partners for doctoral students. All students are encouraged to spend at least one term at a different institution. The application documents underline that CEU PU has a large number of external partners both in academia and in industry. Supervisors are obliged to assist students in finding suitable host institutions. CEU PU provides travel grants for students to spend time as visiting scholars at other universities, institutes or research centres and to attend conferences.

As indicated in criterion §18 (3) 1, planned conferences and research-based non-coursework activities are included in the supervision agreement. Furthermore, at the Department of Network and Data Science there is a regular exchange between faculty and doctoral researchers in weekly seminar series to discuss work in progress. Within this format, it is also possible to invite speakers from other universities or research centres or other departments at CEU PU. Additionally, the whole department participates regularly in "Community Learning Scheme" events to discuss recent scientific publications, exchange useful skills, and reflect on failures.

As the programme offers students many opportunities for exchange with suitable partners within and outside CEU PU, the experts consider the criterion to be **fulfilled**.

Recommendation:

(6) Related to the recommendations concerning criteria §18 (1) 1 and §18 (2) 4, the expert panel recommends to maintain a permanent record of activities such as conference attendances, visits to other universities or research institutes, and industrial contacts of former students. Making such a database available to students would highlight possible exchange opportunities during and career paths after the PhD programme and facilitate access to relevant information. The panel cautions that the gathering and provision of such data needs to take data protection regulations into account.

Supervision and counselling services
3. The private university shall provide the doctoral students with adequate counselling services which are tailored to the specific degree programme.

Counselling responsibilities of the principal and, where applicable, the associate supervisor are clearly defined in the written application documents provided by CEU PU. Supervisors are responsible for regularly advising the student with respect to their project, guiding the student in the research community and caring about problems related to research. Additionally, CEU PU offers confidential psychological counselling services, providing professional help and support for personal concerns.

The experts consider the criterion to be **fulfilled**.

4.4 Assessment criterion § 18 (4) 1 to 8: Degree programme and degree programme management

Degree programme and degree programme management
1. The profile and the intended learning outcomes of the degree programme have been clearly defined. They include scientific as well as artistic competencies, personal skills, and social competencies and are in accordance with level 8 of the National Qualification Framework

In the programme proposal, CEU PU outlines the intended learning outcomes for the programme, which include:

- knowledge of the fundamental ideas of network science,
- scientific competencies (ability to carry out independent research in network science, theoretical, mathematical and computational skills, scientific methods with a focus on network and data science methods, experience with interdisciplinary research collaboration, ability to fulfil research duties in a wide variety of jobs),
- personal skills (analytic thinking, problem-solving, proficiency in academic writing, presentation skills) and social competencies (experience with interdisciplinary research collaboration, ability to work in teams, pedagogical skills).

The intended learning outcomes of the mandatory courses indicate that the programme outcomes are at the most advanced level in terms of knowledge, skills, responsibility, and autonomy.

Since the intended learning outcomes of the degree programme have been clearly defined in the programme proposal and are in accordance with level 8 of the National Qualification Framework, the expert panel considers this criterion to be **fulfilled**.

Degree programme and degree programme management
2. The name of the degree programme and the academic degree correspond to the degree programme's profile.

The name "Network Science" corresponds to the profile of the degree programme. This profile is still novel, since it is a relatively young discipline. The choice of the name reflects the content of the programme, which focuses on network science methods and their application in other research areas such as computational social science. While a number of network science centres have been established around the world, few institutions are able to offer a corresponding PhD programme.

The experts consider the criterion to be **fulfilled**.

Degree programme and degree programme management
3. The minimum duration of studies stipulated in the curriculum is three years. The contents and structure of the curriculum ensure that the intended learning outcomes are achieved, while combining research (research and development and/or advancement and appreciation of the arts) and teaching.

In the programme proposal, CEU PU indicates that the programme corresponds to 240 ECTS credits, that is, four years of full-time studies. The programme is structured as follows: in the first year students take introductory courses to learn about methods and research/application areas for network science methods. They further develop their research questions together with the professors. In the second year students collect and analyse data and in the third and fourth year they develop and finalize their thesis.

The programme proposal includes a list of mandatory courses covering the following intended learning outcomes:

- provide knowledge of the fundamental ideas of network science (e.g. Fundamental Ideas in Network Science),
- statistical skills (e.g. Statistical Methods in Network Science),
- data management and manipulation skills (e.g. Data Mining and Big Data Analytics),
- ability to carry out independent research in network science (e.g. Dissertation Research),
- pedagogical skills (e.g. Teaching Assistance, although the course mostly provides practical training),
- proficiency in academic writing (e.g. Dissertation Writing), presentation skills (e.g. Research Colloquium).

In the experts' opinion, the ability to fulfil research duties in a wide variety of occupations is guaranteed by the wide applicability of the data and network science methods taught in the programme. The online interviews with current PhD candidates have revealed how interdisciplinary research collaborations are promoted through a collaborative culture (e.g. joint seminars) and by the presence of faculty members and doctoral students with different backgrounds (e.g. physics, architecture and economics). In the programme proposal and in the virtual meeting, CEU PU has described some of the past and current interdisciplinary dissertation projects (e.g. on gender inequality in computer science).

The ability to work in teams is associated to some learning outcomes in the course syllabi, but not very prominently. In the course Agent Based Models students must work in pairs, in other courses (Computational Social Science, Data Visualization, Statistical Methods in Network Science) students can form groups and have activities that can be performed in teams or individually. Students can also choose elective courses, which are offered by the department. Furthermore, they can choose any course that is offered by other departments as an elective course.

The experts consider the criterion to be **fulfilled**.

Recommendations:

(7) Currently, doctoral students have to apply multiple times to cover the full 48 months with cumulative stipends. The expert panel feels that this system generates uncertainty and requires additional effort from students who need to apply multiple times for funding repetition. Therefore, the panel suggests updating the system so that four years of stipend are guaranteed to those students passing the comprehensive exam. During the online session with CEU PU's representatives, the expert panel learned that an initiative to reduce the burden of multiple applications has already been drawn up, but that a decision is yet to be taken.

(8) The expert panel recommends specifying which courses guarantee that the ability of working in teams is acquired by modifying the syllabi.

(9) Regarding teaching assistantships, the panel recommends to clarify the learning outcomes and to consider adding some preparatory training.

(10) The expert panel recommends updating the syllabus of the Comprehensive Exam, so that the activities corresponding to its 6 ECTS credits are made more explicit.

Degree programme and degree programme management
4. The workload related to the individual modules ensures that the intended learning outcomes, especially writing the doctoral thesis, can be achieved within the stipulated duration of studies. The ECTS is applied correctly; in any case to the curricular parts (courses) of the degree programme.

The programme comprises 240 ECTS credits. Most of the second year is devoted to research, and most of the third and fourth year are devoted to developing and writing the dissertation. According to the syllabi provided by CEU PU, credits associated with dissertation writing also include the research to produce the content of the dissertation. The expert panel considers the overall workload as well as the allocation of ECTS credits appropriate to achieve the intended learning outcomes and to write the doctoral thesis.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(11) The experts recommend to ensure that the number of credits in the syllabi correspond to the number of credits outlined in the study plan. The programme proposal indicates 16 ECTS credits for Dissertation Writing III, the syllabus 20 ECTS credits.

Degree programme and degree programme management
5. Regulations for doctoral programmes have been established. The examination methods are suitable to assess whether and to what extent the intended learning outcomes have been achieved.

CEU PU has provided several documents that outline regulations for doctoral programmes, including the CEU PU Doctoral Regulations, the PhD in Network Science Handbook and syllabi for all courses in the PhD programme.

The syllabi indicate the examination methods. These methods include different types of examination, e.g. written, oral, project-based and seminar-based. A high percentage of examinations are based on participation. In the virtual meeting, CEU PU explained that this is an appropriate approach, because of the small class size and the high level of activities performed in class. The expert panel finds this balance between a variety of examination forms and a strong reliance on in-class examinations suitable to assess the students of this specific programme. The different types of examination can be used to target different types of knowledge, skills and competencies. Furthermore, continuous evaluations based on discussions and activities allow a deeper examination of complex knowledge and competencies that can be expected at PhD level and in an interdisciplinary educational context. According to the study plan, an exam at the end of the first year covers topics from mandatory courses and will consequently ensure that students achieved a large part of the intended learning outcomes. During the interview session, the experts learned that the exam also assesses the feasibility of the PhD research plan and the ability of candidates to present and discuss their research. This was not clear from the content of the syllabi. In the later years of the programme, research

activities are increasingly included and examined in individual courses as well as in the dissertation and the final defence.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(12) The expert panel recommends clarifying what the Comprehensive Exam is examining. From the documentation and from the interviews, it appears that part of the exam assesses content covered by some of the mandatory courses, but this content is formally already assessed when the credits of these courses are obtained. As the Comprehensive Exam includes 6 ECTS credits, one would expect the assessment to be related to the activities performed during the four weeks corresponding to these credits. Please notice that this recommendation is not about changing the exam, which the panel considers an example of best practice, it only concerns the content of the syllabi.

Degree programme and degree programme management
6. A "Diploma Supplement" that complies with the requirements laid down in Annex 1 to § 6 of the University and Higher Education Statistics and Education Documentation Decree (Universitäts- und Hochschulstatistik- und Bildungsdokumentationsverordnung, UHSBV), original version: F. L. G. II no. 216/2019, will be issued.

A Diploma Supplement was included in the application documents submitted by CEU PU. The Diploma supplement complies with the requirements laid down in Annex 1 to § 6 of the University and Higher Education Statistics and Education Documentation Decree (Universitäts- und Hochschulstatistik- und Bildungsdokumentationsverordnung, UHSBV), original version: F. L. G. II no. 216/2019.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(13) The expert panel recommends adapting the grading scale to the Austrian scale instead of providing a conversion in the Diploma Supplement. The expert panel realises that this is a decision that would be made centrally by CEU PU rather than within a department.

Degree programme and degree programme management
7. The admission requirements have been clearly defined. In terms of the qualification level, they correspond at least to the provisions provided by the Universities Act (UG).

In the programme proposal, CEU PU clearly states the following general admission requirements:

- completed online CEU PU application form,
- proof of English proficiency (TOEFL, ITOEFL, IELTS, Pearson Test of English, Cambridge Proficiency Examination, or Cambridge Advanced English Test),
- two letters of recommendation,
- CV

The programme-specific admission requirements include:

- a Master's degree in one of a broad range of related disciplines including physics, mathematics, computer science, sociology, political science, economics, etc.,
- strong interest in interdisciplinary research and willingness to do quantitative studies,
- detailed account of earlier studies,
- a statement of purpose

The admission requirements are comparable on an international level and the qualification level described is typically expected for a PhD programme. The admission requirements ensure a general level of qualification, which the expert panel considers appropriate given that the programme is centred in a core methodology and the substantive domains in which it is applied may, and should, differ.

The experts consider the criterion to be **fulfilled**.

Degree programme and degree programme management
8. The admission procedure has been clearly defined and ensures a fair and transparent selection of the applicants according to the admission requirements and the required competencies.

In the application documents, CEU PU indicates that applicants are shortlisted by the Doctoral Committee, based on the submitted material and video interviews. In the virtual meeting with the expert panel, CEU PU provided additional details, explaining that admission is coordinated centrally at CEU PU. Subsequently, the applications are sent to the department where a decision on the list of candidates to be interviewed is made. Candidates are interviewed by at least two faculty members, then applications and interviews are reviewed at a joint meeting. During the virtual meeting with faculty and PhD students, as well as from the programme proposal, the expert panel has observed that the admission procedure leads to high diversity and high quality in the programme. Based on the evidence provided by CEU PU, the expert panel is therefore confident that the currently practised admission procedure leads to a fair and balanced selection of applicants, although transparency is not procedurally ensured beyond the faculty.

The experts consider the criterion to be **fulfilled.**

Recommendation:

(14) The crucial selection step takes place when the faculty ranks candidates for invitation. The transparency of the selection during this step relies on the awareness and discipline of the faculty members involved in the selection process. The experts recommend considering and prescribing additional measures that ensure the process is transparent to stakeholders other than the supervising faculty. This could include, for instance, an equal opportunity manager with special training, decision records, or a student observer.

Degree programme and degree programme management
9. The recognition procedures for higher education competencies in terms of crediting towards examinations or parts of a degree programme have been clearly and transparently defined. When recognising or crediting

> *higher education competencies, the Convention on the Recognition of Qualifications concerning Higher Education in the European Region (Lisbon Recognition Convention) shall be considered.*

The proposal specifies graduation requirements (240 ECTS credits, all mandatory coursework, minimum GPA 3.0, and defence of a doctoral dissertation) without ambiguity. Regarding the recognition and crediting of higher education competencies, it is indicated in the documents provided by CEU PU that they follow the European Credit Transfer System and operate in accordance with the Recommendation on Criteria and Procedures for the Assessment of Foreign Qualifications adopted by the Lisbon Recognition Convention Committee.

The experts consider the criterion to be **fulfilled**.

4.5   Assessment criterion § 18 (5) 1 to 5: Staff

Staff
1. The private university has sufficient scientific and/or artistic staff as well as sufficient non-academic staff for operating the degree programme.

The application documents list seven professors and two visiting professors, which the expert panel considers as comfortably sufficient. During the online interview, the panel learned that two more faculty members will be hired, which is reassuring regarding a timely increase in diversity and robustness against faculty turnover. One visiting faculty member is Prof. Barabasi (Northeastern, USA), who is not supervising students and teaches only an elective, as his activities are currently focusing on research. He is participating in an ERC Synergy Project and is acting as a consultant to students.

The preliminary new employment contracts (made necessary by the relocation of CEU PU to Vienna) included in the application documents are only for four years. However, the expert panel was assured during the interview that a change in regulation triggered an extension to six years, thus covering the accreditation period. Further, it was stated during the online interviews that all positions are funded non-temporarily. At this capacity, usual turnover in faculty can be sustained.

According to the information provided by CEU PU prior to the online meeting, the PhD in Network Science programme has one full-time coordinator. In the experts' opinion, this is sufficient to handle administrative issues associated with the programme considering the number of faculty members, courses and students. Furthermore, as indicated in the application documents, additional support staff is available at university level to help with more general issues (IT, legal counselling, communication, general budget and finances and campus services).

The experts consider the criterion to be **fulfilled**.

Recommendation:

(15) The expert panel recommends that future hiring ensures that the extreme gender imbalance is mitigated. Currently, the only female faculty is visiting from Budapest.

According to the CVs provided with the application, four faculty members are associate or full professors with formal venia docendi or equivalent. The three assistant professors hold PhD degrees in relevant areas and have topical teaching experience. All have actively been teaching at universities and in workshops and summer schools. The tenured faculty have (in part extensive) track records in the supervision of doctoral students, and most of the others have previously supervised theses at the bachelor and master level. The expert panel finds that the combined expertise of the faculty covers all required areas, including methodical aspects, study design, software development, and data management. They have worked in interdisciplinary projects across a range of topics. Few other institutions worldwide can claim the same coverage of topical expertise within a single group.

The experts consider the criterion to be **fulfilled**.

According to the application documents, faculty members are limited to supervise at most six doctoral students as main or associate supervisors. Since the documents also state that five to six students are admitted per cohort, this ratio is sustainable.

The experts consider the criterion to be **fulfilled**.

Recommendation:

(16) The expert panel recommends that each candidate is formally assigned an associate supervisor (currently optional), although possibly from a different department or institution.

CEU PU is a research-intensive university. According to the application documents, the typical full-time teaching load for faculty members at CEU PU is 24 ECTS credits over the course of at least two terms. Faculty members with the title of "University Professor" need to teach 16 ECTS

credits. Furthermore, a teaching reduction of altogether 8 ECTS credits for junior faculty can be awarded in the first two years. The teaching load for instructors is 20 ECTS credits. The experts are convinced that the teaching load allows for sufficient time for research. Furthermore, research performance is an important element in the periodic evaluation of academic staff. The expert panel considers the impressive publication records as additional evidence.

The experts consider the criterion to be **fulfilled**.

Staff
5. The private university provides for personnel development measures aimed at the supervision of doctoral students

According to the application documents, CEU PU provides a variety of personnel development opportunities aimed at supervisors, including support from the Center for Teaching and Learning, and training on issues such as time and conflict management. Uptake is not mandatory, but indirectly assessed during the periodic evaluation of teaching and supervision activities of academic staff.

The experts consider the criterion to be **fulfilled.**

4.6   Assessment criterion § 18 (6): Funding

Funding
The degree programme's funding is secured. Provisions have also been made to fund expiring degree programmes.

The application documents contain a budget table that at first view appeared inconsistent with the salaries in preliminary contracts. However, through the submission of additional documents before, and clarifications during, the online interviews, the expert panel learned that CEU PU is in the process of major budget adjustments to account for differences between Budapest and Vienna. All current positions continue to be funded, including the salary adjustments to Austrian standards, and student stipends are increased by 60% to meet Austrian standards. The expert panel was informed that this is covered by a budget increase following an additional EUR 200 Mio from the Open Science Foundation for CEU PU over the next six years. It was also pointed out that the two new faculty positions will not have to be paid from the department's current budget. Overall, the expert panel is convinced that the degree programme's funding is secured.

The experts consider the criterion to be **fulfilled**.

5   Summary and final evaluation

The expert panel is impressed by the programme, which has already been in place at the CEU PU Budapest Campus since 2015, with the first cohorts finished. Despite the tremendous growth of the emerging discipline of network science, few other institutions have been able to set up comparable PhD programmes so far.

Development and quality assurance of the doctoral programme: The programme was developed systematically with input from stakeholders and according to institutional guidelines, including regulations for quality assurance.

Research environment: The Department of Network and Data Science is an active node in international research collaborations, in the process of establishing links to other Vienna-based institutions, and well connected within CEU PU. The participatory organisation of dissertation and project research provides ample opportunities for talented students to thrive. All required facilities are available.

Supervision and counselling: Supervision is taken seriously and regulated sufficiently, but not excessively. The interdisciplinary composition of the student body and international travel opportunities enrich the students' experience by exposing them to input beyond their supervisors. During the online interview with current students, the expert panel felt that their personal accounts confirmed the positive impressions formed from reading the application documents submitted by CEU PU.

Degree programme and degree programme management : The programme is designed to build a shared foundation for a diverse target audience during the first year, and pivots to a strong research focus thereafter. A comprehensive exam ensures that students are prepared for this transition.

Staff: The faculty are excellent. The topic of the PhD programme is their core expertise and they have achieved international recognition through publications, collaborations, and tool provision. Student/staff ratio as well as teaching and supervision expertise are very good.

Funding: The panel has no reason to doubt that the funding described in the documentation and during the online interview is indeed sufficient and secure.

All formal criteria are found to be met, regulations are in place rather than planned and only minor suggestions for improvement have been formulated. The only major recommendation for change that the expert panel has is to increase diversity in the faculty. Currently, all resident professors are male with a background in physics. While topical expertise of the faculty is beyond questioning, some broader coverage of the domains in which networks science is applied would be beneficial. Regarding the current lack of gender diversity within the department, the expert panel strongly recommends to develop strategies in order to reduce the gender imbalance. Both issues can be addressed in the upcoming hiring of two new faculty, in the inevitable event of turnover, and possibly with additional visiting faculty.

The experts **recommend to the Board of the AQ Austria to accredit** the doctoral programme "Network Science".

The expert panel's recommendations to CEU PU:

(1) The expert panel recommends establishing more formal processes to gather and document feedback from academia, industry and society. The panel recommends establishing a process to keep track of the placement and the working situation of former students. The expert panel supports the plan to establish an advisory board as a way to obtain feedback from industry.

(2) The expert panel recommends adding specific Intended Learning Outcomes on good scientific practice to appropriate course syllabi, and to explicate the corresponding methods of assessment. To evaluate the effects of this change, the expert panel recommends looking at the impact on course evaluations in the following years.

(3) While the strong coherence in their disciplinary background serves the faculty well, the experts strongly recommend that in the future, the recruitment of faculty members should focus on increasing disciplinary diversity. In particular, relevant areas of the social sciences should receive special attention, possibly by dual appointments with other departments.

(4) The expert panel recommends establishing a small number of formal institutional partnerships that guarantee a number of places for doctoral students seeking international research stays. Although the core faculty is well connected internationally, a regular exchange with selected institutions could strengthen the visibility of these opportunities for exchange and ease planning.

(5) The expert panel recommends that the department seeks to expand its office capacity. While space is sufficient at the current level, additional student work spaces are deemed beneficial, and the planned hiring of two new faculty will make additional rooms a requirement.

(6) Related to the recommendations concerning criteria §18 (1) 1 and §18 (2) 4, the expert panel recommends to maintain a permanent record of activities such as conference attendances, visits to other universities or research institutes, and industrial contacts of former students. Making such a database available to students would highlight possible exchange opportunities during and career paths after the PhD programme and facilitate access to relevant information. The panel cautions that the gathering and provision of such data needs to take data protection regulations into account.

(7) Currently, doctoral students have to apply multiple times to cover the full 48 months with cumulative stipends. The expert panel feels that this system generates uncertainty and requires additional effort from students who need to apply multiple times for funding repetition. Therefore, the panel suggests updating the system so that four years of stipend are guaranteed to those students passing the comprehensive exam. During the online session with CEU PU's representatives, the expert panel learned that an initiative to reduce the burden of multiple applications has already been drawn up, but that a decision is yet to be taken.

(8) The expert panel recommends specifying which courses guarantee that the ability of working in teams is acquired by modifying the syllabi.

(9) Regarding teaching assistantships, the panel recommends to clarify the learning outcomes and to consider adding some preparatory training.

(10) The expert panel recommends updating the syllabus of the Comprehensive Exam, so that the activities corresponding to its 6 ECTS credits are made more explicit.

(11) The experts recommend to ensure that the number of credits in the syllabi correspond to the number of credits outlined in the study plan. The programme proposal indicates 16 ECTS credits for Dissertation Writing III, the syllabus 20 ECTS credits.

(12)   The expert panel recommends clarifying what the Comprehensive Exam is examining. From the documentation and from the interviews, it appears that part of the exam assesses content covered by some of the mandatory courses, but this content is formally already assessed when the credits of these courses are obtained. As the Comprehensive Exam includes 6 ECTS-credits, one would expect the assessment to be related to the activities performed during the four weeks corresponding to these credits. Please notice that this recommendation is not about changing the exam, which the panel considers an example of best practice, it only concerns the content of the syllabi.

(13)   The expert panel recommends adapting the grading scale to the Austrian scale instead of providing a conversion in the Diploma Supplement. The expert panel realises that this is a decision that would be made centrally by CEU PU rather than within a department.

(14)   The crucial selection step takes place when the faculty ranks candidates for invitation. The transparency of the selection during this step relies on the awareness and discipline of the faculty members involved in the selection process. The experts recommend considering and prescribing additional measures that ensure the process is transparent to stakeholders other than the supervising faculty. This could include, for instance, an equal opportunity manager with special training, decision records, or a student observer.

(15)   The expert panel recommends that future hiring ensures that the extreme gender imbalance is mitigated. Currently, the only female faculty is visiting from Budapest.

(16)   The expert panel recommends that each candidate is formally assigned an associate supervisor (currently optional), although possibly from a different department or institution.

6   Documents reviewed

- Application of the Central European University Private University from 09.01.2020 in the version of 24.02.2020 for the accreditation of the study programme "PhD in Network Science", to be offered in Vienna.

- Submission of further information from 26.03.2020 prior to the online meeting:

  - Video messages on general issues/institutional level CEU PU
  - CEU PU Library Factsheet

- Submission of further information from 14.04.2020 prior to the online meeting:

  - responses to the expert panel's questions
  - further documentation including:
    - Annex 1a - CNS Internal Strategic Report
    - Annex 1b - CEU-CNS Strategic Review External Report
    - Annex 2 - Proposal to Establish Network Science PhD
    - Annex 3 - Course and Supervision Evaluation Scores
    - Annex 4 - CEU PU Research and Development
    - Annex 5a - Campus map and floor plans
    - Annex 5b - Space Allocation Floor 3
    - Annex 6a - DNDS student grants, 2018-19
    - Annex 6b - DNDS DSRG, Summer School and Winter School Grants
    - Annex 7 - CEU Research Support Scheme Policy