AQAS

AGENTUR FÜR
QUALITÄTSSICHERUNG DURCH
AKKREDITIERUNG VON
STUDIENGÄNGEN E.V.

FINAL REPORT

EUROPEAN MASTER ON EMBEDDED INTELLIGENCE NANOSYSTEMS ENGINEERING - FROM NANOSCALE TECHNOLOGIES TO UBIQUITOUS SMART SENSORS" (EMINENT) (MASTER OF SCIENCE)

OFFERED BY

ATHENA EUROPEAN UNIVERSITY

FORMED BY

UNIVERSITY OF SIEGEN (GERMANY),

HELLENIC MEDITERRANEAN UNIVERSITY (GREECE),

NOVA UNIVERSITY LISBON (PORTUGAL),

UNIVERSITY OF ORLÉANS (FRANCE), AND

VILNIUS GEDIMINAS TECHNICAL UNIVERSITY (LITHUANIA)

December 2023

Assessment following the European Approach
for Quality Assurance of Joint Programmes

Content

DECISION OF THE AQAS STANDING COMMISSION

ON THE STUDY PROGRAMME

"EUROPEAN MASTER ON EMBEDDED INTELLIGENCE NANOSYSTEMS ENGINEERING - FROM NANOSCALE TECHNOLOGIES TO UBIQUITOUS SMART SENSORS" (EMINENT) (MASTER OF SCIENCE)

JOINTLY OFFERED BY

- **UNIVERSITY OF SIEGEN (GERMANY),**
- **HELLENIC MEDITERRANEAN UNIVERSITY (GREECE),**
- **NOVA UNIVERSITY LISBON (PORTUGAL),**
- **UNIVERSITY OF ORLÉANS (FRANCE), AND**
- **VILNIUS GEDIMINAS TECHNICAL UNIVERSITY (LITHUANIA)**

Based on the report of the expert panel, the comments by the university and the discussions of the AQAS Standing Commission in its 19th meeting on 4th of December 2023, the AQAS Standing Commission decides:

1. The study **programme "European Master on Embedded Intelligence Nanosystems Engineering – from Nanoscale technologies to ubiquitous smart sensors"** (**Master of Sciences**) jointly offered by University of Siegen (Germany), Hellenic Mediterranean University (Greece), Nova University Lisbon (Portugal), University of Orléans (France), and Vilnius Gediminas Technical University (Lithuania) is accredited according to the criteria and procedures defined in the European Approach for Quality assurance of Joint Programmes.
   The study programme essentially complies with the requirements defined by the European Approach for Quality assurance of Joint Programmes and the European Qualifications Framework (EQF) in their current version. The required adjustments can be implemented within a time period of twelve months.
2. The conditions have to be fulfilled. The fulfilment of the conditions has to be documented and reported to AQAS no later than **31 December 2024**.
3. The accreditation is given for the period of **six years** and is valid until **31 December 2029**.

Conditions:

1. The intended learning outcomes for the Winter School and the Summer School need to be redesigned and equipped with a suitable examination method in accordance with those. In addition, a consistent application of the ECTS calculation is required.
2. It is required to apply consistently the outlined workload calculation for each partner university in the module handbook to increase transparency and expectations for each module.
3. The consortium has to assure re-taking options for exams that allow the required flexibility in case of students' mobility in the following semester.

4. The role of formal and informal mentorship activities needs to be clarified and communicated to students at an early stage of the programme.
5. The consistent collection of teacher's feedback in the EMINENT programme needs to be included to the QA cycle of EMINENT to promote a culture of continuous improvement.
6. EMINENT must raise the level of industry contributions to ensure the long-term sustainability of the programme and the relevance of the programme in line with industry needs.

The conditions were fulfilled on time.

The Standing Commission confirms this with its decision of 26 February 2024.

The following **recommendations** are given for further improvement of the programme:

1. The EMINENT programme should establish on-boarding processes (e.g., for students in the committees and the teaching staff outside the committees) to establish a clear communication of expectations for the programme and a high team cohesion within the whole programme.
2. To harmonise different research backgrounds of the cohorts, it is recommended to implement a mandatory course on research methods and ethics in the discipline at an early stage of the programme.
3. Elective options on entrepreneurship throughout the curriculum and at every consortium's university are recommended to provide specialized knowledge and skills that are crucial for starting and running a successful business.
4. It is recommended to have clearer admission explanations on the placement modalities for students based in Greece and Germany.
5. It is recommended to strengthen industry ties in the curriculum to enhance practical skills development and better prepare students for future career challenges while increasing overall internship flexibility.
6. It is suggested to harmonise the examination methods of the Research lab courses at the consortium's universities.
7. It is recommended to look for diversified funding sources for tailored scholarships, grants, and financial aid to ensure the long-term sustainability of the programme and to underpin the commitment of the industry.
8. It is suggested to establish a regular platform of exchange for teaching staff to discuss different teaching methodologies.
9. It is recommended to improve the joint dimension of industry interaction for the programme by intensifying the involvement of qualified industrial personnel in the curriculum.

With regard to the reasons for this decision the Standing Commission refers to the attached experts' report.

EXPERTS' REPORT ON THE ACCREDITATION

OF THE STUDY PROGRAMME

- **EUROPEAN MASTER ON EMBEDDED INTELLIGENCE NANOSYSTEMS ENGINEERING - FROM NANOSCALE TECHNOLOGIES TO UBIQUITOUS SMART SENSORS (EMINENT) (MASTER OF SCIENCE)**

AT THE UNIVERSITY OF SIEGEN (GERMANY), HELLENIC MEDITERRANEAN UNIVERSITY (GREECE), NOVA UNIVERSITY LISBON (PORTUGAL), UNIVERSITY OF ORLÉANS (FRANCE) AND VILNIUS GEDIMINAS TECHNICAL UNIVERSITY (LITHUANIA)

Date of site visit: 10 – 11 October 2023

Panel of experts:

Professor Dr. Matthias Kranz	University of Passau (Germany), Chair of Embedded Systems
Professor Dr. Daniel Alquier	Université de Tours (France), Vice Presient for Research, Department of Electrical Engineering and Industrial Computer Science
Martina Baucks	Lenze Automation, Aerzen (Germany) (labour market representative)
Daniel Burkhardt	Master's student of Embedded Systems Engineering at University of Freiburg (Germany) (student representative)

Coordinator:

Patrick Heinzer	AQAS e.V., Germany

I. Preamble

The University of Siegen (Germany), together with the Hellenic Mediterranean University (Greece), NOVA University Lisbon (Portugal), University of Orléans (France) and Vilnius Gediminas Technical University (Lithuania), is applying for the accreditation of the study programme "European Master on Embedded Intelligence Nanosystems Engineering – from Nanoscale technologies to ubiquitous smart sensors" (EMINENT) leading to the degree of "Master of Science". This final report by the panel of experts is based on the university's written application documents and the results of the site visit. In particular, the descriptive parts of the experts' report refer to the submitted Self Evaluation Report.

II. Assessment procedure

This report is the result of the external review of the Master's programme in "European Master on Embedded Intelligence Nanosystems Engineering – from Nanoscale technologies to ubiquitous smart sensors" (M.Sc.) offered by the University of Siegen (Germany), together with the Hellenic Mediterranean University (Greece), NOVA University Lisbon (Portugal), University of Orléans (France) and Vilnius Gediminas Technical University (Lithuania).

1. Criteria

The study programme is reviewed in accordance with the criteria of the European Approach for Quality Assurance of Joint Programmes, which was agreed with the Ministers of the European Higher Education Area in May 2015.

2. Approach and methodology

Initialization of the procedure

In February 2023, the University of Siegen mandated AQAS to implement the accreditation procedure using the European Approach. For this purpose, the consortium produced a self-evaluation report (SER) describing the programme in its entirety; this report was submitted in February 2023, together with the necessary documents, the relevant appendices on the study programme.

AQAS analysed the self-evaluation report for completeness, comprehensibility, and transparency. The accreditation procedure was formally initialized at the meeting of the AQAS Standing Commission in May 2023.

The final version of the self-evaluation report was submitted in September 2023.

Nomination of the panel of experts

The composition of the panel of experts follows the stakeholder principle and the requirements described in the European Approach. As a result, representatives from the relevant discipline(s), the labour market and the student body are involved. In addition, AQAS follows the Principles for the Selection of Experts of the European Consortium for Accreditation (ECA).

The AQAS Standing Commission nominated the panel of experts in September 2023. AQAS informed the consortium about the members of the panel of experts, and the consortium did not express any concerns about the composition of the panel.

Preparation of the site visit

Prior to the site visit, the experts reviewed the self-evaluation report and submitted a short preliminary statement containing outstanding issues and any potential need for additional information. AQAS forwarded these

preliminary statements to the consortium and the members of the panel in order to increase transparency of the process and the upcoming discussions during the site visit.

Site visit

Following a review of the self-evaluation report, the site visit was conducted from 10 – 11 October 2023 at the campus of University of Siegen In Germany. During the site visit, the experts held separate discussions to interview various stakeholders, e.g. the university management, programme directors, teaching staff and non-academic staff from the consortium, as well as students. The site visit ended with a presentation of the preliminary results obtained by the expert group to the representatives of the universities.

Preparation of the experts' report

After the site visit, the panel of experts prepared the following report assessing the fulfilment of the criteria set out in the European Approach for Quality Assurance for Joint Programmes. The report included a recommendation to the AQAS Standing Commission. The report was sent to the universities for comment.

Decision

The experts' report, together with the university's comments, is the basis for the AQAS Standing Commission's decision on the accreditation of the programme. Based on these two documents, the Standing Commission made its decision on accreditation in December 2023. AQAS forwarded the decision to the universities, and published the report on its website as well as the DEQAR database.

III. General information

1. Introduction

The European Master on Embedded Intelligence Nanosystems Engineering - from Nanoscale Technologies to Ubiquitous Smart Sensors (EMINENT) is designed as a collaborative master's programme with five higher education institutions in the consortium. These institutions are described as medium-sized and young, and they complement each other by providing a perspective on future embedded intelligence nanosystems. It is stated that four out of the five partners within the EMINENT consortium are already united strategically and structurally as part of the European University ATHENA. The fifth partner, NOVA University of Lisbon (Portugal), has collaborated with the other partners on various projects in the past. The consortium has been formed in such a way that the partners complement each other thematically, providing a broad perspective on future embedded nanosystems. The SER states that the programme strategically complements and expands upon existing national master's programmes, bridging the gap between engineering, physics, material science, nanotechnology, and computer science disciplines.

The EMINENT programme is expected to enhance the attractiveness of the partner institutions and facilitate the recruitment of talented international students. It is designed to provide multi-dimensional added value by leveraging the complementary educational expertise, technological and research focuses, infrastructure capabilities, and diverse industrial connections of the project partners.

According to the SER, it is asserted that Edge Intelligence emerges as a key asset to address Europe's sustainability and digital sovereignty needs, and it is expected to have a substantial economic impact. The authors argue that perceptive intelligent nanosystems are fundamental in future visions, providing the necessary ubiquitous "sensing" and "sense-making" functions that serve as the interface between digitalized systems and humans, as well as the real world.

The EMINENT programme is said to be aimed at preparing students to surpass traditional disciplinary boundaries and fully utilize embedded intelligence components and systems. It reportedly offers advanced training,

starting from nanoscale material and device development, including advanced sensoric and machine-learning components, and extending to macroscale intelligent systems and IoT interconnected devices in various application areas related to information, sensing, and energy. The convergence of nanotechnology with Edge intelligence and smart perceptive sensor systems is claimed to be a significant contributor to Europe's long-term leading position in future ubiquitous digital technologies. Moreover, the consortium argues that these key technologies will enable advanced automation, environmental protection, and climate mitigation as cost-effective, sustainable solutions.

The SER suggests that the EMINENT programme envisions a wide range of possibilities in the embedded intelligence nanosystems market. The consortium believes that crucial application areas, aligned with the overarching Green Deal vision, will include Internet of Things (IoT) and cyber-physical system (CPS) solutions for environmental monitoring, future manufacturing, and autonomous systems. These technologies are seen as offering abundant innovation opportunities to address challenges in energy management, processing, manufacturing, and resource utilization while minimizing the carbon footprint. The authors emphasize that intelligent device and sensor technologies are essential for meeting industrial challenges such as the transition to carbon-free manufacturing and smart grids.

In the view of the SER, the application areas chosen in the EMINENT programme are focused on global challenges and relevant markets in automated systems, environmental and health monitoring applications. The universities argue that these areas represent the most crucial future embedded intelligent devices and smart sensor application domains. However, the authors caution that Europe's transition from being predominantly a consumer of digital hardware to a global leader and provider of IoT and CPS technologies is hindered by a shortage of human talents and innovators in the associated technological and engineering fields. They consider these talents to be critical in making this transition a reality.

The SER highlights that the current market for edge devices, smart sensors, and IoT is experiencing rapid growth. The SER emphasizes the promising synergy between large technology providers and small specialized industries in this field. Referring to a recent manifesto by the European Digital SME Alliance representing 45,000 SMEs in Europe, it is reported that Edge intelligence and IoT present a key opportunity for SMEs to utilize their diverse application-specific knowledge in relevant future digital markets. This, in turn, is expected to foster Europe-led innovation and regain a digital sovereign position.

According to the SER, it is reported that several universities across Europe offer master's programmes in Embedded Systems. In terms of international master's programmes, there are Erasmus Mundus Master's programmes that focus on smart/functional materials, nanoscience and nanotechnology, and embedded systems. However, it is pointed out that none of these existing master's programmes offer a comparable combination of advanced training that spans from nanoscale material and device technology to computing architectures of intelligent sensing elements, including perspectives on macroscale integrated systems and meaningful IoT application areas. The holistic approach taken by the EMINENT programme is reported to be unique at the European level.

2. Basic information

Full name of the programme	European Master on Embedded Intelligence Nanosystems Engineering - from Nanoscale Technologies to Ubiquitous Smart Sensors (EMINENT)
EQF level	7 (Master’s Degree)

Degrees awarded	Master of Science
Number of ECTS points	120 ECTS
ISCED field(s) of study	0714 Electronics and Automation, 0719 Engineering and engineering trades not elsewhere classified

IV. Assessment of the study programme

1. Eligibility

1.1 Status

The institutions that offer a joint programme should be recognised as higher education institutions by the relevant authorities of their countries. Their respective national legal frameworks should enable them to participate in the joint programme and, if applicable, to award a joint degree. The institutions awarding the degree(s) should ensure that the degree(s) belong to the higher education degree systems of the countries in which they are based.

Description

The information given in the SER outlines that all consortium institutions are recognised as higher education institutions with a degree awarding power. It is explained that the universities participating in the joint programme have distinct roles and responsibilities.

The **University of Siegen** in Germany takes on the coordination of the programme and serves as the host for the second semester. They also organize a Summer School and offer a specialisation track in "Embedded Intelligence Sensorics." Additionally, they provide supervision for master's theses.

The **Hellenic Mediterranean University** in Greece hosts the first semester and organizes a Winter School. Their specialisation track focuses on "Functional Materials with Optoelectronic Properties," and they offer supervision for master's theses.

NOVA University Lisbon in Portugal offers a specialisation track in "Natural Materials and Biosensors" and provides supervision for master's theses.

The **University of Orléans** in France offers a specialisation track in "Internet of Things" and provides supervision for master's theses.

Vilnius Gediminas Technical University in Lithuania offers a specialisation track in "Advanced Sensor Systems and Data Processing" and provides supervision for master's theses.

According to the SER, these universities contribute to the joint programme their expertise and resources to provide students with a specialized education in their respective fields.

Graduates from the EMINENT programme will receive a joint degree, awarded by those universities, they have physically studied at for at least one semester (joint degree per track).

Furthermore, the SER provides information on the eligibility of the European Approach for each consortium member.

The self-evaluation report states that the European Approach can be applied for all member institutions apart from the partner based in Greece. In Greece, where the European Approach is not applicable, the agency's report should follow the required national criteria and be submitted to the Hellenic Authority for Higher Education which decides upon national accreditation.

Experts' evaluation

The experts have analysed the provided evidence in the self-evaluation report and the respective annex. The documentation clearly demonstrates that all partners have degree-awarding powers and the programmes on which the EMINENT programme is based are accredited nationally. The panel of experts reviewed the annexes attached to the SER. The evidence affirms that the partners possess the eligibility to conduct a master's programme and to issue a joint degree.

All consortium partners are public higher education institutions with a long-standing tradition. They are recognised in their respective higher education system. Their national legal frameworks authorise their participation in the joint programme. Every student who completes the programme successfully and meets the stipulations set forth by their respective national legislations will be conferred with a joint degree.

It became evident that the choice of consortium partners is based on the ATHENA European Universities Alliance. The experts commend this selection of consortium partners because it underlines the commitment to make the EMINENT programme a success on the basis of already existing research collaborations between the partners in the consortium.

Conclusion

The criterion is fulfilled.

1.2 Joint design and delivery

The joint programme should be offered jointly, involving all cooperating institutions in the design and delivery of the programme.

Description

According to the SER, the curriculum of the EMINENT programme has been jointly designed by the consortium partners. The partners aim to attract talented students to Europe and enhance the efficiency of joint education by leveraging their complementary competences. They provide different thematic specializations aligned with their research focus to ensure education that meets future needs. Each partner institution takes on specific subjects based on their expertise and existing postgraduate programs.

The programme aims to attract students to Europe and enhance joint education by leveraging the diverse expertise of the participating partners. Each partner institution specializes in specific subjects based on their core competencies and existing postgraduate programs. The administrative duties and management structure are shared among the partners, with the coordinator responsible for general programme management. The partners will also contribute to tasks such as admissions management, quality assurance, and resource administration. The text further outlines the specific contributions of each partner institution in terms of subjects, hosting semesters, offering specializations, and providing opportunities for master's thesis topics. Additionally, the programme collaborates with research and industrial partners to expand laboratory capacities and application focus. These partnerships allow students to engage with industry early on and involve industry representatives as guest lecturers, thesis supervisors, and creators of professional experience projects.

The consortium extends its joint approach to administrative duties and establishes a shared management structure. The coordinator, USIEGEN, is responsible for the overall management of the program. The EMINENT committees, comprising representatives from each partner institution, are entrusted with various tasks, including admissions management, quality assurance, and the administration of funds and resources. In fact, the consortium submitted a funding proposal to the European Commission in February 2023 to transform EMINENT into an Erasmus Mundus Joint Master's Programme, which was granted in Summer 2023. University of Siegen (Germany) also assumes the responsibility of allocating students to partner universities based on their individually selected specialization track after the second semester. Additionally, they provide support for student mobility and visa-related matters.

Furthermore, the SER clarifies on the responsibilities for all consortium institutions and elaborates on the specific focus of the higher education institution.

University of Siegen (USIEGEN): Focuses on embedded intelligent sensorics. It hosts the second semester, providing knowledge in microelectronics and nanoelectronics. USIEGEN also organizes a Summer School to facilitate the transition to the third semester. Students specializing in embedded intelligent sensorics spend their third semester at USIEGEN. The university offers master's thesis topics related to embedded sensorics in collaboration with academic/industrial research partners.

Hellenic Mediterranean University (HMU): Provides theoretical and practical skills in solution-processed energy harvesting, storage devices, thermoelectric and gas sensing elements. HMU hosts the first semester, teaching fundamental knowledge in solid-state physics, quantum mechanics, carbon-based materials, and polymer electronics. A Winter School at the end of the first semester introduces specialization tracks. Students specializing in functional materials-based solar cells and gas sensing elements spend their third semester at HMU. The university offers master's thesis topics related to printed electronics in collaboration with academic/industrial research partners.

NOVA University Lisbon (UNL): Focuses on natural materials and biosensors. Students specializing in this field spend their third semester at UNL. The university offers master's thesis topics related to sustainable ubiquitous electronic manufacturing platforms in collaboration with academic/industrial research partners.

University of Orléans (UO): Specializes in the IoT architecture for Industry 4.0, Agriculture 4.0, and their robotized applications. Students in this specialization spend their third semester at UO. The university offers master's thesis topics related to IoT in collaboration with academic/industrial research partners.

Vilnius Gedeminas Technical University (VILNIUS TECH): Provides theoretical knowledge and practical skills in IoT technologies and solutions. The focus is on hardware and software solutions for standalone internet-connected devices. VILNIUS TECH covers topics such as IoT architecture, communication protocols, cloud platforms, IoT data processing, visualization, and security. The university also emphasizes working principles based on artificial neural networks, evolutionary algorithms, fuzzy logic, and implementation using ARM microcontrollers.

The EMINENT programme collaborates with various research and industrial partners, expanding the laboratory capacities and application focus. Industry partners and academic representatives, such as CRESITT Industrie, Microsoft, ATOS, ALtyvor, 3ZA, IBM, CRNS Orléans, Teltonica IoT group, ifm electronic, PMD Tec, Fraunhofer FHR, Infineon, ST Microelectronics, Bosch, and FZ Jülich, are actively involved in modules, guest lectures, thesis supervision, and professional experience projects.

Experts' evaluation

Based on the discussion on-site and the review of the provided evidence, the experts confirm the alignment with the standard. The EMINENT programme is a good example of how a joint programme should be offered, with all cooperating institutions actively involved in its planning and execution.

The curriculum of the EMINENT programme has been carefully put together through a joint effort involving all consortium partners. This team approach aims not only to attract highly talented students but also to enhance the effectiveness of collaborative education. The partners use their strengths, offering a range of specialised subjects aligned with their respective research focus areas. This ensures that the education provided is relevant and tailored to meet the evolving needs of the future. It became evident that the consortium's experiences in collaborative research activities within the consortium support the joint design of the programme.

Furthermore, allocating specific subjects to partner institutions based on their areas of expertise and existing postgraduate programmes highlights a well-organised division of labour and knowledge. This strategic allocation ensures that each partner institution contributes optimally to the overall academic landscape of the programme.

Administrative responsibilities and management structures are carefully shared among the partners, with a designated coordinator taking on the overall responsibility for the programme's general management. This fair distribution of administrative duties shows a commitment to shared ownership and accountability, an essential aspect of successful joint programmes.

The involvement of the University of Siegen (USIEGEN) as the coordinator responsible for the programme's overall management further demonstrates a centralised yet collaborative leadership approach. The creation of EMINENT committees, with representatives from each partner institution, highlights a balanced distribution of tasks, including admissions management, quality assurance, and the careful handling of financial resources. This multi-institutional committee structure encourages shared decision-making and reinforces a sense of inclusivity and collaboration.

Securing funding from the European Commission to elevate EMINENT into an Erasmus Mundus Joint Master's Programme in Summer 2023 is a significant milestone. This achievement confirms the collaborative model's effectiveness and affirms the programme's potential impact on the broader educational landscape.

The University of Siegen, in addition to its coordinating role, plays a crucial part in assigning students to partner universities based on their individually chosen specialisation tracks after the second semester. This assignment process emphasises a strategic focus on personalised student experiences, ensuring students are matched with partner institutions that align with their academic interests.

Furthermore, the detailed outline of the specific focus areas of each participating institution offers a comprehensive understanding of their unique contributions to the programme. Each institution brings a distinct academic perspective, from embedded intelligent sensorics to solution-processed energy harvesting, enriching the overall educational experience.

To further enhance the collaborative spirit of the EMINENT programme, it is suggested that the programme establish comprehensive onboarding processes (**Finding 1**). These processes should extend to students in the committees and teaching staff outside the committees. Such onboarding measures are crucial in understanding expectations, roles, and responsibilities clearly. They also serve as a fundamental mechanism for building a culture of strong team cohesion, thereby strengthening the overall effectiveness of the joint educational initiative.

From the expert's point of view, the onboarding processes play an essential role in integrating individuals into a collaborative structure like the EMINENT programme. This involves a structured introduction to the

programme's objectives and expectations for students. It provides a clear roadmap, ensuring they are well-prepared to navigate the diverse academic landscape and maximise their learning experience. This aspect is vital, especially in the complex structure of the ERASMUS Mundus programmes, with several moves between higher education institutions.

Based on the discussions on site, it became evident that EMINENT plans to have student representatives in some committees. A fact that the experts applaud. However, especially at the beginning of the programme, the onboarding activities in this regard should be evident and fit for purpose. A robust onboarding process would offer insights into their roles and responsibilities within the programme's governance structure. They would gain a comprehensive understanding of how their contributions align with the broader objectives of the joint programme. This clarity empowers students and fosters a sense of ownership and accountability, which are fundamental for effective committee participation.

For teaching staff outside the committees, the onboarding process is equally crucial. It serves as a platform for familiarising them with the collaborative framework and their role in achieving the programme's educational goals. It enables them to appreciate the collective effort required to deliver a high-quality education, enhancing their sense of belonging and commitment.

A well-structured onboarding process in both directions can facilitate relationship-building among students and teaching staff, creating a strong community within the programme. It provides a forum for individuals to connect, share insights, and forge collaborative partnerships that can lead to enriched educational experiences.

Conclusion

The criterion is fulfilled.

1.3 Cooperation agreement

The terms and conditions of the joint programme should be laid down in a cooperation agreement. The agreement should in particular cover the following issues:

- Denomination of the degree(s) awarded in the programme

- Coordination and responsibilities of the partners involved regarding management and financial organisation (including funding, sharing of costs and income etc.)

- Admission and selection procedures for students

- Mobility of students and teachers

- Examination regulations, student assessment methods, recognition of credits and degree awarding procedures in the consortium.

Description

The consortium submitted a consortium's agreement which includes the key points of joint programmes, such as the academic collaboration framework, responsibilities and liabilities, information on the governance structure, the academic programme, QA responsibilities, admission and selection criteria, the final degree, and financial arrangements.

With regard to the governance structure includes the consortium coordinator and several committees (EMINENT steering committee, admission committee, examination committee, ethics committee, the EMINENT Global committee, and an external evaluation committee). The agreement outlines the different responsibilities of these committees and their composition.

Experts' evaluation

The experts have analysed the proposed cooperation agreement and discussed the foundational framework and its services with the EMINENT team to delineate the consortium's roles, responsibilities, and operational procedures.

The evidence submitted outlines in the cooperation agreement that the awarded degree is a "Master of Science" (M.Sc.) upon successful programme completion. According to the track, this designation is jointly conferred by the partner universities upon accumulating at least 30 ECTS credits.

The cooperation agreement further specifies coordinative tasks and responsibilities within the consortium, which clarifies three crucial aspects: consortium coordination, roles of partners, and academic and financial management.

From the expert's perspective, the straightforward appointment of a consortium coordinator within the consortium is key to ensuring seamless coordination among partner institutions. Based on the discussion on-site, it was evident that USIEGEN undoubtedly fills this role. The strategic oversight extends to critical areas such as programme planning or progress monitoring. The composition of many committees represented by all consortium partners under the chair of USIEGEN streamlines decision-making processes. In case of any operational challenges, it should be ensured that resolutions are quickly taken. The experts believe that this role also serves as a liaison between the consortium and other stakeholders regarding fostering transparent communication channels.

Furthermore, the comprehensive delineation of partners' roles within the agreement exemplifies a commitment to clarity and accountability. By explicitly outlining the obligations of each partner, this practice leaves no room for ambiguity or misinterpretation. It establishes a shared understanding of the specific contributions and responsibilities expected from each partner institution. In addition, each partner institution assumes accountability for programme activities within their purview. This clearly demonstrates a shared commitment to the programme's success. The respective paragraphs also include information on the mandate for prudent financial management of allocated funds. This underscores a commitment to fiscal responsibility and shows stakeholders' confidence regarding the judicious use of resources, ultimately enhancing the programme's sustainability and impact.

The agreement also includes information on the admission and selection procedures for the EMINENT programme, which consists of the tasks of the admission committee. From the external perspective, the mechanisms and framework of this approach show effectiveness. It also clarifies scholarship requisites and ways to get funded as a student. The partnership agreement indicates a clear timeline for candidates. It clarifies which documents students might expect at which stage of the procedure (e.g., draft student agreements or scholarship details). Overall, the admission and selection procedures, as reviewed by the external panel, demonstrate a robust and inclusive approach which ensures fairness and transparency throughout the process.

Following the partnership agreement on the mobility of students, it is evident that the agreement defines the structure of the EMINENT programme and, thus, the mobility of students. It is determined that the EMINENT Global committee will ensure the internationality of the programme, which also includes staff mobility. Therefore, the experts believe this might be the starting point for implementing a regular exchange platform for teaching staff involved in the EMINENT programme (**see Finding 12**).

Furthermore, the agreement includes paragraphs concerning the examination regulations, offering a framework for coursework for the consortium and emphasising its role in self-monitoring research-based learning

and exam preparation. This framework allows flexibility and promotes consistency. The regulations accommodate electronic coursework and examinations by allowing criteria for conducting assessments electronically.

Overall, the cooperation agreement stands as a well-crafted framework that addresses the essential elements outlined in the standard. It provides a foundation for the successful implementation of the joint programme, encompassing many essential components when establishing a joint degree programme. Incorporating various committees and associated partners demonstrates a thoughtful approach to collaborative endeavours.

Conclusion

The criterion is fulfilled.

2. Learning outcomes

2.1 Level

The intended learning outcomes should align with the corresponding level in the Framework for Qualifications in the European Higher Education Area (FQ-EHEA), as well as the applicable national qualifications framework(s).

Description

According to the SER, the curriculum of the EMINENT programme has been jointly designed by the consortium partners. The partners aim to attract talented students to Europe and enhance the efficiency of joint education by leveraging their complementary competencies. They provide different thematic specializations aligned with their research focus to ensure education that meets future needs. Each partner institution takes on specific subjects based on their expertise and existing postgraduate programmes.

The EMINENT programme has been designed to meet the standards for quality assurance of joint programmes in the European Higher Education Area (EHEA). It was stated that the programme aligns with the second cycle of the QF-EHEA (master's level) and consists of existing national master's degree programmes that fit the national degree systems of the five partner countries involved.

The SER highlights that upon successful completion of the EMINENT core educational programme, students will acquire specific knowledge and skills. It was mentioned that they will gain an understanding of and the ability to apply fundamental engineering and physical principles of nanotechnology fabrication techniques and functional nanomaterials. Furthermore, they will be able to apply and integrate knowledge in the fields of nanodevices, nanoelectronics, embedded systems, and sensorics. It was also stated that they will understand and design control systems, embedded processing, machine learning, signal processing, and data communication for intelligent system development. Additionally, students will develop soft and research skills, including oral and written communication, active listening, cultural intelligence, team building, intercultural communication, time management, and academic writing and reviewing skills. It was emphasized that they will learn to evaluate and reason on constraints encountered when solving problems in embedded intelligent systems, taking into account ethical, regulatory, political, social, and economic perspectives. Moreover, students will acquire learning skills that will enable them to study in a self-directed or autonomous manner and critically analyse research literature.

Regarding the specialization tracks within the programme, the agreement states that each track has additional specific learning outcomes. For instance, students in the HMU track will understand, design, develop, and apply knowledge on functional materials for energy harvesting and optoelectronic applications. In the USIEGEN track, they will gain knowledge in embedded intelligent sensorics and their nanotechnological realization, particularly for image sensors. The UNL track will focus on understanding, designing, developing, and

applying knowledge on the use of natural materials for green electronics, intelligent systems, and environmental monitoring. In the UO track, students will learn about microsystems, data infrastructures, smart devices, and integration technologies for the internet of things. Lastly, the VILNIUS TECH track will cover smart systems and data processing for large data infrastructures.

In addition, the documentation submitted with the SER includes a matrix showcasing the alignment of the programme with the relevant qualifications frameworks.

Experts' evaluation

From the experts' point of view, the disciplinary fields covered by the EMINENT program are broad, ranging from nanomaterials to the application of artificial intelligence to sensor fields. Mastering such a broad range remains a real challenge for master's students, although having such skills is a real advantage in these fields. During fruitful discussions with the program's teaching staff, mention was made of the experience acquired by some of the partners on programs that are also highly multidisciplinary, such as the one proposed here, which will benefit this programme and has been considered a positive aspect for the experts. After reviewing the documentation and discussing with the relevant stakeholders, it can be attested that the programme academically demonstrates complete alignment with the Framework for Qualifications in the European Higher Education Area (FQ-EHEA) at the second cycle level. The submitted evidence of the consortium fosters the alignment. The documentation clearly marks the reference between national qualifications frameworks, the programme, and the FQ-EHEA. It is expected that the programme consistently meets and often exceeds the expectations for advanced knowledge, critical thinking, and specialized skills in the field of nanosystems engineering.

Conclusion

The criterion is fulfilled.

2.2 Disciplinary field

The intended learning outcomes should comprise knowledge, skills, and competencies in the respective disciplinary field(s).

Description

The academic programme aims to provide students with a comprehensive set of skills and knowledge. They will gain an understanding of fundamental engineering and physical principles related to nanotechnology fabrication techniques and functional nanomaterials. Additionally, they will be able to apply their knowledge in various fields such as nanodevices, nanoelectronics, embedded systems, and sensorics. The programme also focuses on teaching students how to design and comprehend control systems, embedded processing, machine learning, signal processing, and data communication for the development of intelligent systems.

Apart from technical skills, the programme emphasizes the development of key soft and research skills that are crucial for career advancement. These include effective oral and written communication, active listening, cultural intelligence, team building, intercultural communication, time management, academic writing, and reviewing skills. Students will also learn how to evaluate and reason about constraints, considering ethical, regulatory, political, social, and economic perspectives when solving problems involving embedded intelligent systems.

Moreover, the programme aims to equip students with the necessary learning skills to continue their studies in a self-directed or autonomous manner. They will be capable of performing critical analyses of research literature.

In addition to the core programme, each specialization track offers specific learning outcomes. In the HMU track, students will gain knowledge and skills related to functional materials for energy harvesting and optoelectronic applications. The USIEGEN track focuses on embedded intelligent sensorics and their nanotechnological realization, particularly for image sensors. The UNL track emphasizes the use of natural materials for green electronics, intelligent systems, and environmental monitoring. The UO track provides an understanding of the value chain of the Internet of Things, ranging from sensors to data infrastructure, with a focus on Industry 4.0 and Agriculture 4.0. Lastly, the VILNIUS TECH track focuses on smart systems and data processing for large data infrastructures.

Experts' evaluation

Based on the on-site visit, the documentation given to the experts and the analysis of both, it can be concluded that the EMINENT programme can equip students with diverse knowledge, skills, and competencies in the field. Although at first sight, the programme seems to be thematically broad, the EMINENT team have put together a programme that provides a comprehensive education that complies with all components of a programme on the master's level. This analysis has been fostered by an in-depth matrix of the relation between the disciplinary field, their intended learning outcomes, and the courses provided. It underpins a clear and structured approach towards a high level of education. It became evident that the programme offers high disciplinary knowledge and skills concerning nanotechnology fabrication techniques and functional nanomaterials. Also, from the soft skills perspective, the programme exposes students to sufficient opportunities during the programme.

In summary, the presented intended learning outcomes on the programme level adequately encompass the discipline of the EMINENT programme. The documentation clearly outlines the key components all students achieve while differentiating between the ILOs for the specialisation tracks.

Conclusion

The criterion is fulfilled.

2.3 Achievement

The programme should be able to demonstrate that the intended learning outcomes are achieved.

Description

The achievement of the intended learning outcomes in the programme will be ensured through various measures, as stated by the SER. According to the information provided by the consortium, the programme achieves this by offering carefully selected modules that provide students with relevant subject knowledge in the first two semesters. These modules are designed to build on the foundational knowledge and allow students to gain more specialized knowledge in their chosen specialization tracks during the third semester. The documentation includes a module handbook that provided further information on the content of the modules.

The SER mentions that qualified scholars, who are specialists in their respective subjects and have extensive teaching experience, will be responsible for teaching these modules. Their expertise and experience contribute to the effective delivery of the programme.

Furthermore, the partner universities are said to be equipped with well-equipped laboratories, lecture rooms, and other supportive facilities to facilitate the practical elements of the course. The consortium believes that this hands-on approach is emphasized throughout the programme, with examples such as the mandatory research lab course in the third semester and the elective course "Professional Experience Projects (PEP)" offered at USIEGEN in the second semester.

To enhance the overall development of students, the programme includes Soft Skill courses as an integral part of the curriculum. These courses aim to improve skills such as oral and written communication, team building, cultural intelligence, and time management, among others.

The documentation also highlights the involvement of guest lecturers from industry, which contributes to the program's industry relevance. Their participation ensures that students are well-prepared for the labour market and exposed to real-world perspectives.

In terms of teaching and learning approaches, the programme strives to adapt a student-centred approach, utilizing modern methods such as the flipped-classroom approach and SCRUM. These approaches aim to create an engaging learning environment and enhance the learning experience.

The SER mentions the EMINENT mentoring system, which provides support to students throughout their academic journey. This system ensures that students receive guidance and assistance when needed.

Regular assessment of the learning outcomes is emphasized, with exams, presentations, coursework, and other evaluation methods used to monitor students' progress. The specific assessment methods for each module are outlined in the module handbook. The final demonstration of achieving the intended learning outcomes takes place in the last semester when students work on their master's projects, write their theses, and defend them before their supervisors.

Experts' evaluation

As mentioned, the experts are confident about the consortium's ability to provide students with high-quality courses, teaching staff, and labs fully adapted to the EMINENT programme. Based on the discussion and the framework explained to the experts, the programme fully complies with the standard. The experts analysed and discussed the assessment criteria outlined in the examination regulations. The regulations include clearly defined steps for coursework, the final course exam, and the master's thesis. The course descriptions outline the assessment methodologies. Depending on the university in the consortium, there might be mid-term evaluations or final examinations. It has been attested that both modalities confirm each student's learning process. The course descriptions also provide evidence of the adequacy of final examinations concerning the intended learning outcomes on the course level.

Conclusion

The criterion is fulfilled.

2.4 Regulated professions

If relevant for the specific joint programme, the minimum agreed training conditions specified in the European Union Directive 2005/36/EC, or relevant common trainings frameworks established under the Directive, should be taken into account.

The joint degree is exempt from the European Union Directive 2005/36/EC. For this reason, the criterion is not applicable.

3. Study programme

3.1 Curriculum

The structure and content of the curriculum should be fit to enable the students to achieve the intended learning outcomes.

Description

According to the information provided, the EMINENT programme is a two-year master's programme taught entirely in English. The SER outlines that students have to take 30 CP each semester, which equals to a 120 CP master's programme.

The first year focuses on building fundamental theoretical and experimental knowledge in nanomaterials and their application in sensing devices. During the first semester, all students attend the Hellenic Mediterranean University to gain a basic understanding of functional nanomaterials. In the second semester, students move to the University of Siegen to study sensors, sensing devices, and embedded systems.

In the third semester, students choose one of the five specialisation tracks:

- Embedded intelligent sensorics (USIEGEN),
- Functional materials with optoelectronic properties (HMU),
- Internet of Things (UO),
- Natural materials and biosensors (UNL), or
- Advanced sensor systems and data processing (VILNIUS TECH).

Each university offers a mandatory research lab course during this semester to prepare students for their master's project. It is recommended for students to stay at one university for their entire second year to focus on their chosen specialisation.

Throughout the programme, there are additional activities such as a Winter School hosted by the Hellenic Mediterranean University after the first semester, providing an introduction to the specialisation tracks. Similarly, a Summer School hosted by the University of Siegen after the second semester helps students transition to the third semester by grouping them based on their chosen specialisation.

The documentation provided outlines with more details the curriculum of the EMINENT programme as follows:

In the first semester, at the Hellenic Mediterranean University (HMU), students study fundamental aspects of functional materials, including properties, fabrication processes, and characterization. This semester includes courses such as Condensed Matter for Semiconductor Physics, Chemistry of Materials, Graphene and 2D Materials & Devices, Winter School in solution processed materials-based nano-sensors, Technology Exploitation, Polymer Electronics, and Journal Club and Research Skills.

The second semester, at the University of Siegen (USIEGEN), focuses on fundamentals of sensors, devices, and embedded systems. Courses include Photonic Devices, Semiconductor Electronics, Micro-electronic Sensors, Microelectronics, Summer School, Advanced Semiconductor and Microelectronics, Physics of nano-electronic devices, Synthetic Aperture Radar, and Professional Design Experience Project.

During the third semester, students can choose from different specializations. At HMU, the specialization is in Functional Materials with Optoelectronic Properties, which includes courses such as Research Lab Course: Devices Processing Techniques and Characterization Methods, Energy Devices (Solar Cells and Batteries), Nanomaterials for Energy, Skills and Ethics in Science, and Principles of Lasers.

At USIEGEN, the specialization is in Embedded Intelligent Sensorics, which includes courses such as Digital 2D 3D Image Sensing, Research Lab Course Nanosynthesis, Nanosafety and Nanoanalytics, Deep Learning, Embedded Systems, Embedded Control, Microsystem Fabrication and Test, Nanotechnology, Laboratory Course in Communications Technologies, and Semiconductor Electronics Design.

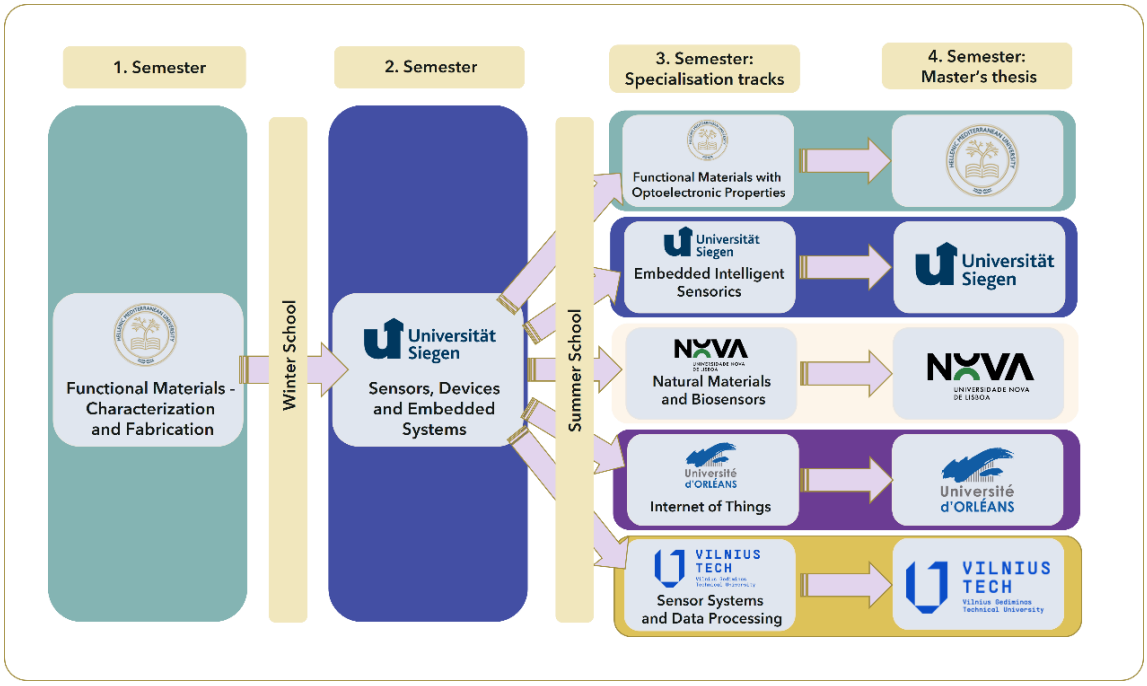
NOVA University Lisbon (UNL) offers the specialization in Natural Materials and Biosensors, which includes courses such as Biosensors, Paper and cellulosic materials, Soft Skill Course, Research Lab Course, Environmental Monitoring and big data, Sensors: Materials and applications, Adv. Programming for Data Science and Engineering, and Molecular Diagnostics.

The University of Orléans (UO) provides the specialization on the Internet of Things (IoT), which includes courses such as Processor architectures, Data analytics, Robotics 1, Control 1, Research Lab Course: IoT and data exploitation, Full-stack integration, Data transmission, Servers and database, and Smartphones.

Vilnius Gediminas Technical University (VILNIUS TECH) offers the specialization in Sensor Systems and Data Processing, which includes courses such as Intelligent Systems, Microcontrollers of ARM Architecture, Research Lab Course: Internet of Things (with course project), High-Frequency Circuit Design, Data Mining Techniques, Data Centres, Hydropower and Biofuel.

The fourth semester is dedicated to the implementation of the master's thesis, with a total of 30 credits (ECTS) assigned.

An overview has been added to the documentation and is as follows:



Experts' evaluation

From an overall point of view, the experts appreciated the willingness of the partners to install progression throughout the course, from the basic building blocks of materials to global systems and data processing. The whole programme is spread out over the first three semesters, with the possibility of specialization from the

third one, with an interesting and complementary variety of courses proposed by each of the consortium partners. Overall, it can be confirmed that the curriculum adequately reflects the intended learning outcomes on the programme level.

The curriculum presented to the experts shows that the EMINENT programme enables students to a robust command of fundamental engineering and physical principles underpinning nanotechnology fabrication techniques and functional nanomaterials. This proficiency, rooted in a solid theoretical foundation, is reflected in their adeptness at applying these principles to real-world scenarios. The curriculum enables student to have a comprehensive integration of knowledge in the domains of nanodevices, nanoelectronics, embedded systems, and sensorics. This holistic understanding enables them to approach complex challenges with a multidisciplinary perspective, ensuring innovative and effective solutions. The programme furthermore will provide students with technical proficiency. In addition to the core programme, the specialized tracks within EMINENT offer additional intended learning outcomes that further enhance the depth of expertise according to the specialisation track.

The evidence submitted to the experts clearly outlines the nature of the programme and all relevant components. The course descriptions are on a high level, clearly outlining the intended learning outcomes on the course level. There is a clear reference between the curriculum and the documentation available to students. This will lead to a high level of accountability between the students and the consortium, and within the consortium.

However, the discussion with the various stakeholders showed that some points should be addressed contributing to the improvement of the curriculum, namely the winter and schools, a need for setting up a collaborative research approach, and integrated entrepreneurship opportunities in the curriculum.

Firstly, the consortium decided to implement a winter school at HMU in the first semester, and a summer school at USIEGEN in the second semester (both equivalent to 3 ECTS each). Based on the discussions during the site visit and the course descriptions provided to the experts, it became evident that the scope of these courses is rather to provide students with orientation concerning the specialisation tracks. The intended learning outcomes on the course level reflect that the course outlinings will raise the awareness on the specialisations within the programme. From the experts' point of view, these courses are indeed very helpful because of the necessity of providing students with orientation right from the beginning of the programme. However, the content of the courses does not reflect the expected level of a master's programme. The intended learning outcomes on the course level for the winter and summer schools currently include descriptors such as "Being aware" or "Having an overview". The intended learning outcomes on the course level for a master's programme expect to involve a deep and comprehensive understanding of a field of the discipline. This implies a higher level of proficiency than mere awareness. Consequently, the consortium has to figure out a way to raise the level of content for both courses with a clear alignment according to level 7 of the EQF (and a fitting assessment method) or has to give room for more discipline-related content for these courses, while shifting the content of these courses towards the student support activities (**Finding 2**).

Secondly, it is expected that the consortium will receive applicants from diverse student backgrounds given the fact that the programme as such covers a very broad topic. It is also expected that there might be differences in previous exposure to research ethics because of different research traditions, possibly different regulatory frameworks, or institutional policies. The panel of experts and the consortium discussed this matter, and it was agreed that it will be necessary to keep this in mind and propose solutions adapted to this diversity. With the focus on ensuring a common understanding on research ethics and research cultures, it is highly

recommended to implement a mandatory course on research methods and ethics at an early stage of the programme (**Finding 3**). From the experts' point of view, this will enable the consortium to establish a collaborative approach within the consortium. Based on the discussions, it is believed that this will be an easy task for the consortium because there had been plenty of research collaborations between the consortium partners in the past.

Thirdly, the current curriculum includes a strong entrepreneurship track at UNL. This is rooted to the background of the university where this is systematically integrated in the majority of study programmes. A fact that is very applauded by the experts. The discussions with the labour market and the teaching staff clearly indicated that graduates of the programme will not only become researchers. Given the dynamic business environment of the discipline and the market demand for graduates coming from those programmes, the experts want to underline the fact that entrepreneurial exposure will be important in the curriculum. The exposure of students to hand-on experience in real-world settings will be beneficial for the graduate's profile. It will enhance their capability to apply their knowledge and will enable them to start Startup ventures easier. The experts fully acknowledge that there might be different experiences within the consortium in this regard, and the experts clearly does not want to point that not every consortium needs to follow UNL's path of making that mandatory, but additional opportunities should be given to students who do not choose the UNL track. Therefore, at least elective options on entrepreneurship throughout the curriculum and at every consortium's university are recommended to provide specialized knowledge and skills that are crucial for starting and running a successful business (**Finding 4**).

Conclusion

The criterion is partially fulfilled.

3.2 Credits

The European Credit Transfer System (ECTS) should be applied properly and the distribution of credits should be clear.

Description

The programme is structured into modules, which encompass different teaching and learning methods such as lectures, seminars, and practical courses. The credit points awarded to students are determined based on their estimated workload, with each credit point representing 25-30 hours of work. The modules within the programme are assigned between 3 and 9 ECTS credits, depending on their content and complexity. Additionally, students will receive grades for their performances, such as examinations, which contribute to their overall module grade.

Experts' evaluation

The information is available in the module handbook, which makes it easily accessible to students and provides them with a clear overview of the distribution of the credits. The evidence clearly showed that the consortium applies ECTS. Examples of uncommon awarding of half credits were explained sufficiently during the site visit.

The panel of experts have analysed the documentation submitted, including the course descriptions for all courses at all partners in the consortium. This source clearly shows a joint approach towards course

descriptions, including a comparable depth of information. The study plan overview clearly indicates an even distribution of credits following the ECTS User's Guide.

Conclusion

The criterion is fulfilled.

3.3 Workload

A joint bachelor programme will typically amount to a total student workload of 180-240 ECTS-credits; a joint master programme will typically amount to 90-120 ECTS-credits and should not be less than 60 ECTS-credits at second cycle level (credit ranges according to the FQ-EHEA); for joint doctorates there is no credit range specified.

The workload and the average time to complete the programme should be monitored.

Description

According to the information provided, the standard period of studies for the EMINENT programme is four semesters, which includes the completion of a master's thesis and master's thesis examinations. Students are required to earn 30 ECTS (European Credit Transfer System) credits per semester. These credits are obtained by taking both mandatory and elective courses offered by the universities. Each semester, students must complete a specific number of mandatory modules (ranging from 2 to 4), and they have the opportunity to choose elective courses to reach the total of 30 ECTS credits, which is the minimum requirement.

In the fourth semester, an additional 30 ECTS credits will be awarded upon the completion of the master's thesis. Therefore, to obtain their joint master's degree, students must have accumulated a total of 120 ECTS credits. It's important to note that a master's thesis can only be issued once a student has earned at least 80 ECTS credits.

In addition, the consortium submitted more detailed information concerning the examination policies within the consortium, the workload, the credits, and the grading system.

Experts' evaluation

The experts confirm that the structure of the EMINENT programme fully complies with the standard. The programme requires 120 ECTS credits for completion. The structure presented in the SER indicates that students are required to earn 30 ECTS credits per semester and, consequently, 60 ECTS credits per year. This structure is consistent with the expectations for workload. The master's thesis can only be issued once a student has earned at least 80 ECTS credits (following the examination regulations).

The structures at each consortium's partner include monitoring of workload, and the coordinating university collects data concerning the average study time of students. The experts want to point out that adherence to ECTS standards concerning workload is highly important. It ensures standardised experience across the partner universities and fosters transparency and comparability. After the thorough discussion and the evidence provided during the site visit, it became evident that each module within the joint programme states a clearly defined credit number with an underlying reference to the workload for the specific course. However, the ECTS User's guide outlines that consistency is important when applying ECTS, encompassing factors such as contact hours, independent study hours, assessment methods, and intended learning outcomes on the course level. After analysing the available documentation, it became clear that each consortium member applies a workload between 25 and 30 hours per credit. The examination regulations stated a specific basis for the credit

calculation, ranging from 26.7 to 30 hours per credit. However, when looking at the micro-level (the course descriptions), it became clear that there are different applications of ECTS on the course level at some consortium partners, which contradicts the stated calculation in the examination regulations. The experts fully acknowledge that there might be different approaches. Still, due to transparency and comparability reasons that underline the joint composition of the programme, it is required to consistently apply the ECTS for each partner university in the module handbook to increase expectations for each module (**Finding 5**).

Conclusion

The criterion is partially fulfilled.

4. Admission and recognition

4.1 Admission

The admission requirements and selection procedures should be appropriate in light of the programme's level and discipline.

Description

Following the SER, the target group for the selection procedure of the EMINENT master's programme includes students who have excellent grades and want to advance their knowledge in nanotechnology and nanodevices. These students are expected to be committed to contributing to technology advancement and real-life applications, both within and beyond Europe. The responsibility for the selection and admission of students lies with the EMINENT Admission Committee, as agreed in the consortium agreement.

Students who wish to be admitted to the EMINENT master's programme must meet certain minimum requirements. They are required to have a Bachelor's degree in an engineering or natural science discipline with at least 180 ECTS credits. The final grade of their degree will be translated to the German grading system using the modified Bavarian formula, and a minimum grade of 2.0 ("gut") is expected. Additionally, applicants must demonstrate a good command of the English language at the B2 level, which can be validated through certifications such as TOEFL iBT (minimum score 93) or IELTS Academic (minimum score 6.5 with no individual score below 6).

During the admission process, the Admission Committee evaluates applicants based on criteria such as education and academic merit, soft skills and relevant experience, and recommendation letters. The number of admissions is determined by the available capacity, with an expected intake of 30-35 students per year. A reserve list is also prepared, and in the case of equal scores among applicants, preference is given to those with higher scores in education and academic merit. Additionally, female students and students with disabilities are given preferential consideration.

Applicants who have received their secondary education in English or have completed a bachelor's or master's degree with English as the language of instruction are exempted from the English language test. Conditional admission is possible if proof of qualification (bachelor's degree) is not available at the time of application, with the requirement to submit the final degree certificate and transcript of academic records before August 1st.

Admitted students receive a draft Student Agreement and are provided with information on the necessary next steps, including signing and returning the Student Agreement and applying for a visa. The coordinating university for enrolment is USIEGEN, where students stay enrolled throughout the programme, while also enrolling as second listeners at the respective hosting university during their mobility.

Applicants who are not admitted to the programme have the option to appeal the selection decision within one week, and the response to the appeal is prepared by the Admission Committee and approved by the EMINENT Steering Committee. Students are enrolled in the campus management system at USIEGEN to track their earned credits.

Experts' evaluation

During the site visit, the admission requirements and the selection procedure have been intensively discussed with the relevant stakeholders. The responsibility for the admission of students lies with the EMINENT Admission committee, with representatives from each partner having in-person or virtual meetings once a year. This is regulated in the partnership agreement.

The discussion shows that the consortium the academic backgrounds of students will be broad, including students coming from electrical engineering, computer science or similar programmes. While the panel of experts acknowledges that a diverse background of students will benefit the programme, and synergies might be created out of that, it might also become a challenge for the consortium, but this will be an ongoing process for the future once the programme has started. Moreover, being an Erasmus Mundus master's programme, the EMINENT programme is expected to attract European and non-European students of diverse cultural, geographical, and academic backgrounds. The admission process is clearly defined in the documentation and SER. The measures taken to make the admission process equitable for students from various backgrounds are commendable.

In addition, the discussion with the stakeholders focused on the necessity of including motivation letters in the admission process. Both experts and consortium members agreed that motivation letters should not be part of the process due to the danger of ambiguity and shift from measurable criteria such as academic merit. Consequently, the admission regulations include:

- Two recommendation letters.
- Optionally, information on publications or other relevant experience or soft skills.
- A CV.
- The copy of the students' passport.

Being an Erasmus Mundus programme, the requirement is to have a minimum of two study periods in two countries, and these countries must be different from the country of residence of the student at the enrolment stage. Consequently, this requirement might intervene with applicants from Germany or Greece who would like to take the specialisation track later in Germany or Greece. Therefore, it is recommended to have higher transparency on the placement modalities for German and Greek students during the admission phase on this matter (**Finding 6**).

Conclusion

The criterion is fulfilled.

4.2 Recognition

Recognition of qualifications and of periods of studies (including recognition of prior learning) should be applied in line with the Lisbon Recognition Convention and subsidiary documents.

Description

According to the SER, it is stated that the Examination Regulations are aligned with the principles of the Lisbon Recognition Convention. It is possible to have study and examination credits from other state or state-recognised higher education institutions recognised if the achieved learning outcomes match the intended learning outcomes of the modules in the EMINENT programme. The recognition of previous degrees and the crediting of coursework and examinations are determined by the EMINENT Examination Committee, as mentioned in the relevant paragraph in the partnership agreement. If examination results are recognised, the grades are carried over and included in the calculation of the final grade. The recognised credits will be indicated in the Transcript of Records. The determination and conversion of grades into the German grading system will be done using grade conversion tables between USIEGEN and its partner universities, such as the EMINENT grade conversion table specified in the examination regulations. Otherwise, the modified Bavarian formula will be applied.

Experts' evaluation

Based on the available documentation, the consortium provided evidence that the recognition processes for prior learning align with the Lisbon Recognition Convention. According to the examination regulations, the decision-making body on this matter is the EMINENT Examination Committee. Since there is less experience in managing a jointly developed programme and consequently with recognition processes of such a broad background, the consortium is encouraged to create a uniform recognition process further.

Furthermore, the examination regulations specify the grade conversion for courses at the relevant partner universities. This regulation provides students with a transparent overview and creates a high level of accountability.

Conclusion

The criterion is fulfilled.

5. Learning, teaching and assessment

5.1 Learning and teaching

The programme should be designed to correspond with the intended learning outcomes, and the learning and teaching approaches applied should be adequate to achieve those. The diversity of students and their needs should be respected and attended to, especially in view of potential different cultural backgrounds of the students.

Description

The SER explains that the curriculum is based on existing courses from national master's programmes, which have well-defined learning outcomes and assessment methods. It mentions that the Module Handbook provides details about the content, learning outcomes, and objectives of each course. Furthermore, it states that a research lab course will be offered in the third semester to enhance students' practical skills and prepare them for the master's project.

The documentation highlights that the curriculum has a student-centred approach, promoting independent learning and problem-solving. It mentions the use of modern pedagogies and technologies, such as the flipped classroom approach. The lecture sessions will be recorded and accessible through Moodle for students to review before class. Classroom time will focus on discussions and demonstrations of competences related to the uploaded material. Additionally, students will work in multinational teams using the SCRUM framework, fostering independence in learning.

Following the SER, it is explained that colloquial talks on programme topics will be organised, inviting experts from academia and the labour market. It mentions that this will provide additional value to the programme and expose students to the latest developments. Opportunities for MSc thesis implementation and PhD positions will also be generated. The SER notes that the project funds will cover the costs of invited speakers from industry and the Erasmus staff mobility funding will support experts from another country teaching students.

In terms of support services, the text states that students will benefit from various services (see resources). It mentions the availability of introductory courses on the EMINENT Open Course Ware Platform to help align students' knowledge levels. Academic tutors will provide guidance, and special needs students will receive appropriate support. The International Relations Offices will facilitate communication among students from different cultures to prevent conflicts related to cultural diversity.

The SER explains that training weeks will be included for scholars to improve their teaching skills in pedagogies and technology trends. External trainers will be invited to conduct these sessions.

The documentation provided by the consortium mentions the regular evaluation of pedagogical methods through online questionnaires accessible through Moodle. It states that students will be asked to provide feedback on the overall educational process at the end of the fourth semester. The effectiveness of the pedagogical methods will be assessed based on students' performance in examinations and other assessments.

Experts' evaluation

Based on the SER documentation and the on-site follow-up discussions, the experts attest that the programme demonstrates adherence between the teaching and learning activities and the intended learning outcomes on the programme and the course level. It became evident that a plus of the programme is the fact that the EMINENT programme draws on established courses from national master's programmes, each with clearly defined learning objectives and assessment methods. This, combined with the consortium's joint efforts and approaches, ensures that the curriculum is directly tailored to meet the programme's intended learning outcomes on the programme level.

Regarding teaching methods, the programme takes a student-centred approach, emphasizing independent learning and practical problem-solving. By nature, there are differences in teaching techniques. Still, the panel of experts sees that as cultural enrichment in the programme. The discussions with the teaching staff of all partners showed that modern styles, including flipped classroom models, are integrated into the learning process. Some courses are recorded and available online, allowing students to review content before in-person sessions.

Consequently, students will benefit from a dynamic learning approach. Given the size of the teaching staff, it would be helpful to create a collective teaching spirit to share best practices and provide community feedback (**see Finding 12**). A real plus is establishing these links through face-to-face contact, with schools (winter/summer) representing an exciting space. If this idea of community seems already well established for students, it would be interesting to extend it to teaching staff (certainly extended to the administrative staff).

The discussions with the teaching staff members indicated that a notable feature of the programme is its focus on hands-on skill development. Including a research lab course in the third semester provides students with valuable practical experience, preparing them for the master's projects. From a teaching point of view, industry colleagues' involvement in teaching can vary broadly from one partner to another. In a programme like EMINENT, which is geared towards the European "industries of the future" (factories 4.0 or 5.0), it seems crucial to involve industry stakeholders of the programme (big players, SMEs or start-up companies) more closely in training, and not just through simple seminars. It would be useful for the programme to set objectives in this area. It is expected to increase students' flexibility concerning internships (**Finding 7**).

The student support services will assume an important role within the EMINENT programme. The experts believe that the planned introductory courses on the digital platform will help students accommodate teaching and learning approaches at the consortium universities. The academic tutors will support this.

It has been demonstrated that the consortium strives to adopt a proactive approach to continuous improvement. While teaching methods are regularly assessed through student feedback surveys, allowing for adjustments as needed, informal activities amongst the teaching staff are suggested (**see Finding 12**). This will enable the consortium to foster the joint teaching character and provide an opportunity for peer exchange.

Conclusion

The criterion is fulfilled.

5.2 Assessment

The examination regulations and the assessment of the achieved learning outcomes should correspond with the intended learning outcomes. They should be applied consistently among partner institutions.

Description

According to the SER, modules in the EMINENT programme are concluded with an examination based on the intended learning outcomes specified for each module, as mentioned in the Module Handbook. The Examination Regulations, provide further details on the examination procedures. The Module Handbook also contains information about the format of examinations and the required coursework for each module in the EMINENT program.

In certain courses, the lecturers will monitor the students' progress through their digital fingerprints, enabling them to assess the students' commitment and effort in the course. If a student is at risk of failing, extra meetings with the course tutors (PhD students) and their team will be arranged, following the SCRUM framework. Furthermore, the lecturer will evaluate the class's performance to reassess their own teaching methods.

Experts' evaluation

Based on the consortium's framework presented to the experts, it can be stated that the EMINENT master's programme is dedicated to a comprehensive academic experience for its students. The analysis of the intended learning outcomes on the course level and the discussion with the stakeholders on measuring such achievement demonstrated a fair evaluation and application of the assessment regulations across the partner institutions. While there are differences in assessments during the courses between the partner countries, it is ensured that the assessment regulations correspond effectively with the programme's intended learning outcomes. Each module concludes with an examination to measure the student's learning progress. In addition, the examination regulations provide comprehensive details on the assessment procedures, offering students

and teaching staff a clear roadmap for the assessment process. This clarity is essential for maintaining consistency in assessment practices across partner institutions. However, it became clear that different examination methods are used in the research lab courses across the consortium's universities. These specialised courses require a standardised approach to evaluate students' performance accurately. The experts believe harmonisation ensures students are assessed using similar criteria, regardless of their chosen partner institution (**Finding 8**).

As typical in joint degree programmes, the mobility structure might lead to a misbalance in re-sitting options because students are expected to move from one institution to another while examinations are still pending. The current version of the examination regulations for EMINENT make it mandatory to have a re-sit option in the following semester, which might cause bureaucratic and organisational problems for students. Recognising the dynamic nature of learning and these potential challenges, students may face, it is necessary to define flexible re-taking options within the examination regulations (**Finding 9**). From an expert's point of view, this flexibility would acknowledge that academic progress may vary among students. This approach cultivates a more inclusive and supportive learning environment by accommodating diverse learning styles and circumstances. It is understood that the assessment methods should not conflict with the assessment rules for the different master's programmes at each institution, which form the basis of this programme. All parties agreed during the discussions that clear rules would be given and applied to the programme.

The panel of experts concluded that the EMINENT consortium is committed to a stringent assessment on the course level and, consequently, on the programme level. The experts have been supplied with detailed examination procedures. Although the points raised above should be taken into account, the overall framework for consistently assessing students is in place.

Conclusion

The criterion is partially fulfilled.

6. Student support

The student support services should contribute to the achievement of the intended learning outcomes. They should take into account specific challenges of mobile students.

Description

According to the information provided by the consortium, the EMINENT programme offers a range of support services to students throughout their academic journey. These services begin from the application phase and continue until the completion of their studies.

It was mentioned that students who express interest in the EMINENT programme will be assigned a personal Enrolment Advisor. The Enrolment Advisor assists students by answering their questions, evaluating their eligibility for admission, and guiding them through the application process. Additionally, an FAQ section will be made available on the EMINENT website to provide further information.

Furthermore, each partner university participating in the EMINENT programme designates a contact person as part of the EMINENT Global unit. This unit works closely with the local International Offices and other support units to provide comprehensive assistance. They facilitate student mobility, organize cultural activities, and offer guidance on various matters such as visa applications, finding accommodation, and addressing administrative concerns.

To ensure a smooth transition for new students, the EMINENT Global Office, in collaboration with the hosting university staff, organizes a Welcome Day at the beginning of each winter semester. During this event, students have the opportunity to meet each other and receive important information about the programme structure, syllabus, academic and non-academic actors, available facilities, scheduled mobility opportunities, and future career prospects.

Upon acceptance into the EMINENT programme, students receive an electronic manual called "How To Get Around EMINENT" (HowToGEMIN). This manual serves as a comprehensive guide, providing essential contact information within the EMINENT consortium, details about the campuses, programme structure, mentoring system, accommodation options, psychological support services, transportation information, and regional cultural events and attractions.

To assist students in their academic journey, the programme offers introductory courses through the EMINENT Open Course Ware Platform. These courses, tailored to different stakeholder groups, provide fundamental knowledge and include self-assessment tests. Students also have access to short presentation videos on each specialization track, offering insights into the basics, impact, market size, and employment opportunities within each field.

The EMINENT programme incorporates a Mentoring System to support students in achieving their learning objectives and ensuring their overall comfort. This system operates on two levels. At the beginning of their studies, students are assigned an Academic Tutor who offers guidance on academic matters. The academic tutor remains available to students via email, phone, video conferences, or face-to-face meetings for the first three semesters. Afterward, supervision transitions to the master's thesis supervisor. Additionally, during their mobility period at partner institutions, students are assigned a local Student's Buddy who assists them in integrating into campus life and the local society.

The programme provides platforms for student interaction and support. The Moodle Platform offers a chat room for students to connect and assist each other. Similarly, the programme's social media channels, including Facebook and Instagram, serve as additional communication channels.

In terms of career support, the EMINENT programme keeps its platforms updated with PhD vacancies and open positions in relevant technologies and partner institutions. Furthermore, students can access the general Career Service offerings provided by the ATHENA European University, which include workshops, events (such as virtual job fairs), and personal career advice.

Special attention is given to students with special needs, and the EMINENT consortium ensures the availability of dedicated services at all partner universities. These services include appropriate equipment, accessible accommodation within campus dormitories, and ongoing support throughout their studies.

Lastly, the EMINENT Global Office organizes a virtual joint graduation celebration for all EMINENT graduates of the respective year, allowing students to celebrate their achievements together.

Experts' evaluation

As an Erasmus Mundus programme, the curriculum includes moving between countries at least twice in a two-year term. Therefore, it is evident that student support plays an important role, and various actions need to be coordinated and taken into account. The plans for the programme already showed that the consortium's support instruments include orientation support and academic and non-academic advising.

On a structural aspect, the EMINENT programme will implement an EMINENT Global unit comprising each consortium partner's representative. This unit will serve as a contact point with each partner's international office, establish an Alumni Club, or advise on bureaucracy matters. Therefore, this unit will serve as a support

framework for the programme's activities. This unit will also provide information on university-wide support structures at each partner university.

Concerning the orientation programme offered by EMINENT, it was discussed between the experts and the consortium that accepted students will receive an orientation manual. This manual will include contact information, an explanation of the consortium's facilities, an overview of the programme structure, and housing opportunities for each partner university. In addition, the programme foresees a buddy system from the beginning of the study programme. Before starting the programme, introductory courses are offered to students online. These courses aim to harmonise students' backgrounds before the study programme starts. The courses are entirely voluntary and have a maximum length of three weeks. Overall, these general preparations undertaken by the consortium are thoughtful, and the experts commend them. However, the discussion showed that there are two levels of mentorships implemented for the EMINENT programme: informal mentorship and formal mentorship. While the assigned academics will take over formal mentorship, the informal mentorship (the before mentioned buddy system) will be someone who is not part of the EMINENT programme but a student who has studied in the last year at the respective university. From the experts' perspective, these mentorship modalities play a crucial role. One point of discussion was strengthening the cross-cohort exchange of the programme. This could potentially happen during the winter and summer schools. Also, the moment of contact between the buddies and the students is crucial for the programme. Students should be paired with their buddy partner early to use the synergies at a higher level in terms of accommodation and moving issues. Thus, it is recommended that these activities be expanded and explained to students early in the programme (**Finding 10**).

The experts learned the programme was granted with the Erasmus Mundus Grant in 2023. This is a fact that will secure scholarship opportunities for future cohorts, which is a big plus for the programme. However, it has also been discussed that this scholarship opportunity is currently the only possibility for funding students. Due to the high importance of the programme and the increasing demand for graduates in the discipline, the experts and all relevant stakeholders have agreed that finding diversified sources for scholarships and grants will be essential for a sustainable programme. During the site visit, the panel of experts learned that the possibilities of cooperation with industries still need to be fully exploited and encouraged the universities to follow this path. Thus, one way might be to involve industry partners in that process to strengthen their commitment to the programme (**Finding 11**).

Conclusion

The criterion is fulfilled.

7. Resources

7.1 Staff

The staff should be sufficient and adequate (qualifications, professional and international experience) to implement the study programme.

Description

According to the SER, it was mentioned that the modules of the EMINENT programme will be taught by experienced and high-ranking researchers and lecturers who are active in the respective fields. It was stated that these modules are already well-established in ongoing local master's programmes, and the lecturers have many years of experience in teaching these topics. Additionally, it was reported that new aspects, such as increased

exchange of lecturers and promotion of co-teaching, the involvement of experts from industry as guest lecturers, and the introduction of pedagogical methods like the flipped classroom approach, will be introduced to enhance the program. The documentation of the programme includes CVs of the lecturers responsible for the EMINENT programme.

In addition, it was reported that the academic coordinators of USIEGEN, HMU, UO, and VILNIUS TECH are active participants in the ATHENA project, funded by the European Commission. Their involvement in various work packages of the project, particularly in areas such as "Education," "Governance," "Industry," and "Dissemination," was highlighted. Furthermore, it was reported that these coordinators play a significant role in establishing the ATHENA European University, where international cooperation in research and education is emphasized.

Lastly, it was mentioned that USIEGEN, as the coordinator, will appoint the General Secretary to serve as the interface between the Steering Committee and the other EMINENT committees. The General Secretary will have the opportunity to attend all committee meetings, but without a voting right, according to the information provided.

Experts' evaluation

The experts analysed the documentation available in the SER. They followed up their analysis with a discussion with the teaching staff members participating in the site visit on-site and online. Although the European format for CVs suggested by the EU would have been desirable, the comprehensive CVs validate the commendable composition of the teaching staff for the EMINENT programme. The consortium can draw on highly experienced staff members. Therefore, the experts are confident in the programme's ability to deliver a high-quality educational experience.

The consortium combines different teaching methodologies of multiple partners. The consortium demonstrated that the partner universities have research collaboration experience with each other. Therefore, the communication channels are expected to be easy. It has been stated by the stakeholders that the consortium sees the EMINENT programme as a learning chance for continuous professional development. It is foreseen that the partner representatives meet once or twice a year to exchange their experiences. From the experts' perspective, the experiences on which the consortium is based and the willingness to further enhance their bonds are to be commended. However, the experts believe this exchange opportunity should be amplified by finding a way to exchange among all teaching staff members in the consortium. Thus, it is suggested to establish a regular platform for the exchange of teaching staff (**Finding 12**). Potentially, such a platform can offer an opportunity for the teaching staff to discuss different teaching methodologies and a point of exchange for good practices. This will foster the consortium's collaborative environment and contribute to the EMINENT programme's student-centred approach.

The consortium and experts have emphasised the importance of the programme to be aligned with the industry's needs. The experts have, in general, no doubt that each consortium member has relevant contacts in the industry. Those experiences will be clearly beneficial, but the experts see that there is still room for improvement in terms of establishing a joint dimension of industry collaboration for the programme as such. The external stakeholders have already pointed out their interest in stronger interaction with the programme. This aligns perfectly with the programme's overall orientation towards the industry of the future. Thus, it is recommended to intensify the involvement of qualified industrial personnel in the curriculum (**Finding 13**).

The site visit should also show that solid and motivated administrative teams supporting the programme are crucial. At each partner university, these teams play an important role in the functioning of the EMIMENT programmes beyond the academic activities. All relevant stakeholders are aware of this important task and consider it to be an important factor in ensuring the effective implementation of the EMINENT programme. The

discussions showed that there are still some things to be addressed in terms of administrative support (see above).

Conclusion

The criterion is fulfilled.

7.2 Facilities

The facilities provided should be sufficient and adequate in view of the intended learning outcomes.

Description

According to the SER, each partner university in the EMINENT programme provides the necessary facilities and equipment for students to achieve the intended learning outcomes. The documentation includes an overview of the relevant facilities which can be summarised as follows:

University of Siegen (USIEGEN):

It is stated that USIEGEN offers various research units associated with the EMINENT programme, including departments of Electrical Engineering and Computer Science, Physics, and Chemistry and Biology. The facilities available include laser labs, clean rooms, microscopy labs, communication labs, and high-performance computing facilities.

Hellenic Mediterranean University (HMU):

HMU states to have facilities within the Department of Electronic Engineering and Computer Science and the Department of Electrical Engineering and Computer Science. They offer equipment such as laser systems, optoelectronic devices, synthesis and characterization tools, spectroscopy instruments, and electrical characterization systems.

NOVA University of Lisbon (UNL):

UNL outlines that four research centres with diverse equipment, including spectrometers, microscopes, synthesis tools, characterization instruments, clean room facilities, electrical characterization systems, and film coating and printing equipment.

University of Orléans (UO):

UO provides practical work opportunities for EMINENT students. They offer development kits containing Raspberry Pi boards, microcontroller boards, and other essential components. Students also have access to laboratory equipment, a FabLab, network equipment, virtual reality headsets, EMC measurement tools, and robotic platforms.

Vilnius Gedeminas Technical University (VILNIUS TECH):

According to the SER, VILNIUS TECH offers lectures in dedicated auditoriums and computer classes within the Faculty of Electronics. They have specialized research laboratories equipped with servers, switches, development boards, testbeds, programming languages, and software tools like MATLAB and Python.

It is outlined that these facilities and equipment play a crucial role in supporting the teaching activities and research endeavours of the EMINENT programme at each partner university.

Experts' evaluation

The site visit clearly illustrated the fulfilment of the standard by each partner university within the EMINENT programme. During the site visit, all partner showcased their facilities sufficiently, demonstrating that there are fitting facilities to support the intended learning outcomes for the EMINENT programme. While the on-site tour at USIEGEN gave the chance to see various research units associated with the programme, encompassing departments such as Electrical Engineering and Computer Science, Physics, and Chemistry and Biology, all other partners demonstrated the relevant facilities according to the tracks offered within the curriculum.

The detailed exposition of facilities and equipment at each partner university underscores a comprehensive and robust infrastructure that effectively supports teaching and research endeavours within the EMINENT programme.

Conclusion

The criterion is fulfilled.

8. Transparency and documentation

Relevant information about the programme like admission requirements and procedures, course catalogue, examination and assessment procedures etc. should be well documented and published by taking into account specific needs of mobile students.

Description

According to the information provided by the consortium, it was stated that all relevant information about the programme will be provided on the EMINENT website. The information available on the website includes details about the member institutions, the curriculum, and the intended learning outcomes. Additionally, the website will feature information about the admission requirements and deadlines, as well as student support services, including visa support. Furthermore, events and news related to the programme will also be shared on the website.

The report mentioned that several important documents will be available for download from the website, such as the Student Agreement, the Application Formula, and the Examination Regulations.

Moreover, it was reported that the EMINENT programme will be promoted through the channels of each partner university and the ATHENA European University. Social media platforms such as Twitter and LinkedIn will also be utilized to target researchers, industry professionals, and young talents. These platforms will feature prepared summaries and feature articles that highlight the strengths of the programme. The report also stated that the programme will be actively promoted at various venues related to information technology, sensorics, wireless communications, computer architecture, and AI processing.

To facilitate communication and dissemination with stakeholders, a regular EMINENT e-newsletter will be published. The newsletter will be in English and will be sent to interested candidates, identified experts, and media representatives who subscribe through the project website. Additionally, press releases will be issued at the European and national levels, coinciding with important deadlines, project events, and milestones.

In terms of student enrolment, it was mentioned that students will enrol at USIEGEN, and all their achievements will be recorded in the campus management system (UNISONO) of the University of Siegen. The programme will utilize the joint Moodle platform of the ATHENA European University as the learning management system, where lecturers will upload relevant teaching materials and communicate with the students.

Experts' evaluation

The panel of experts have discussed the consortium's plans concerning the adequate documentation and presentation of the EMINENT programme. During the discussions, it became evident that the consortium plans to have a comprehensive and well-structured approach to disseminating information on the programme. The dissemination strategy includes information for externals, including the admission requirements, application procedures, the module handbook, and examination details. In theory, it seems that everything will be made easily accessible. Given the fact that the EMINENT programme will start in the academic year 2024/2025, it has been anticipated that the homepage will be put online in November 2023. During the site visit in October, the homepage was still in its initial stage, and both experts and consortium members agreed on the importance of an active and content-rich website. After the site visit, further evidence has been given that the homepage is still an ongoing process, but the information provided on the homepage will allow potential applicants to gain insights into the programme, consortium members, the curriculum, and practical information such as an average on the living costs. Thus, the current status of the homepage can be described as an initial moment that complies with the threshold of the standard. However, the experts suggest a more proactive approach to promoting information through various channels, including social media platforms and e-newsletters (**Finding 11**). A multi-faceted strategy will ensure the EMINENT programme reaches a diverse audience and support relationship-building with external stakeholders.

As part of the documentation, the consortium clearly described the learning management systems the programme will use. The platform is already in place at each of the partner universities. Therefore, this should be put into practice easily.

Overall, the provided text is meticulously crafted to meet the specified standard. It fulfils the criteria set forth and goes above and beyond by incorporating a range of strategies to effectively disseminate information and attract prospective students to the EMINENT programme.

Conclusion

The criterion is fulfilled.

9. Quality assurance

The cooperating institutions should apply joint internal quality assurance processes in accordance with part one of the ESG.

Description

The Consortium has established a quality assurance process for the EMINENT programme, aiming to maintain and assess the quality of education. The process involves internal and external evaluations that adhere to institutional rules and national regulations.

Internal quality assurance relies on existing measures and is overseen by the EMINENT Examination Committee. Regular evaluations of modules and courses are conducted, with each partner appointing a local QA team responsible for administering approved tools such as electronic questionnaires, surveys, and face-to-face interviews. The resulting reports are submitted to the Examination Committee, which extracts key insights and offers recommendations to the partners and EMINENT Steering Committee. These internal evaluations are discussed during biannual Steering Committee meetings, involving all relevant stakeholders.

Students actively participate in the internal evaluation by utilizing an online questionnaire accessible through the EMINENT Learning Management System (Moodle). They provide feedback on modules, learning outcomes, teaching staff performance, and their own progress at the end of each semester. Feedback on the overall educational process is sought at the end of the fourth semester. Students also evaluate

administrative and organizational services. In cases of student dropout, interviews are conducted by the Examination Committee to gather feedback and understand the reasons behind the decision. The Steering Committee considers this feedback to make appropriate improvements to both academic and non-academic aspects of the program.

Scholars involved in the program also contribute to the internal evaluation. They assess students' academic proficiency at the end of each semester to enhance the selection process. Lecturers evaluate module content and learning outcomes, suggesting necessary modifications and additions based on technological advancements. Scholars provide internal evaluations of the curriculum, considering content relevance, employed technologies, pedagogical approaches, and the quality of MSc thesis projects. Invited scholars provide feedback on administrative and organizational aspects. The Examination Committee evaluates examination and assessment processes across partner institutions every two years, ensuring consistency in alignment with learning outcomes, success rates, and incorporating student feedback.

Administrative staff undergoes internal assessments every two years, focusing on integration and efficiency of digital tools, adherence to pre-defined procedures for admission, funding, and examinations, addressing administration complications, and evaluating the degree awarding process.

External evaluation is conducted by the EMINENT Observatory Panel, composed of external experts appointed by the Steering Committee. These evaluators receive the results of internal evaluation surveys and provide input on curriculum updates, pedagogical approaches, multicultural experiences, market interaction, higher education policies, and marketing policies in higher education. Additionally, re-accreditation on the program level is carried out every six years, following the European Approach for Quality Assurance of Joint Programmes.

Experts' evaluation

During the site visit, the experts panel gained evidence that the consortium has established quality assurance processes that comply with the standard. The EMINENT Examination committee oversees the activities carried out by internal units at each partner university, a crucial point of contact within the EMINENT processes. The partnership agreement regulates the scope for internal QA activities, including the focus on student-centredness, the employability impact of graduates, activities to ensure correspondence between ECTS, the examination and the intended learning outcomes, and several satisfaction surveys. The discussion showed that the scope of the QA activities currently does not primarily include the experience of the teaching staff in the relevant partner university. However, the experts believe that this feedback will show important insights that should be considered by the consortium in the further development of the EMINENT programme. On the other hand, it might give an additional drive towards the joint character of the programme because it will give a chance to underpin the joint character of EMINENT. Thus, the consistent collection of teacher feedback in the EMINENT programme must be included to promote a culture of continuous improvement (**Finding 14**).

The discussion with the relevant stakeholders showed that the industry is strongly interested in the programme. It also became clear that the partner universities in the consortium have valuable contacts from the industry on local, regional, and national levels in each country. However, EMINENT aims to overarch the discipline transnationally with a programme that has a high relevance beyond borders. It became clear that external stakeholders had been rather seen as end users of graduates than in a more participative way. This is not a weak point per se. Still, the external stakeholders have demonstrated their willingness to support and contribute in many ways to the EMINENT programme (e.g., representation in relevant bodies, internships, guest lectures, or similar). The experts believe a more inclusive approach towards external stakeholders is required here. This will benefit the long-term development of the EMINENT programme beyond the Erasmus Mundus grant on the long-term.

In contrast to the positive interest of external stakeholders, their current representation in relevant bodies needs to align with the high level of interest observed during the site visit. The panel of experts is convinced

that an important point for the quality assurance of EMINENT is the contribution of industry partners. Consequently, EMINENT must find a way to raise the level of industry support to ensure the long-term sustainability of the programme and its relevance to industry needs. One way to address this matter might be the systematic inclusion of international and national labour market representatives (**Finding 15**).

Conclusion

The criterion is partially fulfilled.

10. Recommendation of the expert's panel

1. The EMINENT programme should establish on-boarding processes (e.g., for students in the committees and the teaching staff outside the committees) to establish a clear communication of expectations for the programme and a high team cohesion within the whole programme.

2. The intended learning outcomes for the Winter School and the Summer School need to be redesigned and equipped with a suitable examination method in accordance with those. In addition, a consistent application of the ECTS calculation is required.

3. To harmonise different research backgrounds of the cohorts, it is recommended to implement a mandatory course on research methods and ethics in the discipline at an early stage of the programme.

4. Elective options on entrepreneurship throughout the curriculum and at every consortium's university are recommended to provide specialized knowledge and skills that are crucial for starting and running a successful business.

5. It is required to apply consistently the outlined workload calculation for each partner university in the module handbook to increase transparency and expectations for each module.

6. It is recommended to have clearer admission explanations on the placement modalities for students based in Greece and Germany.

7. It is recommended to strengthen industry ties in the curriculum to enhance practical skills development and better prepare students for future career challenges while increasing overall internship flexibility.

8. It is suggested to harmonise the examination methods of the Research lab courses at the consortium's universities.

9. The consortium has to assure re-taking options for exams that allow the required flexibility in case of students' mobility in the following semester.

10. The role of formal and informal mentorship activities needs to be clarified and communicated to students at an early stage of the programme.

11. It is recommended to look for diversified funding sources for tailored scholarships, grants, and financial aid to ensure the long-term sustainability of the programme and to underpin the commitment of the industry.

12. It is suggested to establish a regular platform of exchange for teaching staff to discuss different teaching methodologies.

13. It is recommended to improve the joint dimension of industry interaction for the programme by intensifying the involvement of qualified industrial personnel in the curriculum.

14. The consistent collection of teacher's feedback in the EMINENT programme needs to be included to the QA cycle of EMINENT to promote a culture of continuous improvement.

15. EMINENT must raise the level of industry contributions to ensure the long-term sustainability of the programme and the relevance of the programme in line with industry needs.