

Assessment report

of the Erasmus Mundus Joint Master
Degree Programme in COMPUTER SCIENCE
FOR THE HUMAN-CENTRIC AND
SUSTAINABLE INDUSTRY (EMaCS) offered
by

UNIVERSIDAD DE BURGOS (UBU) (Spain)
HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN
HAMBURG (HAW) (Germany)
INSTITUTO POLITÉCNICO DE COIMBRA (IPC) (Portugal)
TURUN AMMATTIKORKEAKOULU (Turku UAS) (Finland)
UNIVERSITATEA DE VEST DIN TIMISOARA (UVT) (Romania)

Review coordinated by ACSUCYL following the European Approach on
Quality Assurance for Joint Programmes

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Executive Summary

This report is issued by the panel appointed by ACSUCYL in the framework of the ex-ante accreditation request of the Erasmus Mundus Joint Master Degree Programme in Computer Science for the Human-Centric and Sustainable Industry (EMaCS) submitted by the University of Burgos (coordinating institution) on behalf of the EMaCS consortium:

- *UNIVERSIDAD DE BURGOS (UBU) (Spain)*
- *HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN HAMBURG (HAW) (Germany)*
- *INSTITUTO POLITÉCNICO DE COIMBRA (IPC) (Portugal)*
- *TURUN AMMATTIKORKEAKOULU (Turku UAS) (Finland)*
- *UNIVERSITATEA DE VEST DIN TIMISOARA (UVT) (Romania)*

The application concerns a joint master programme of 120 ECTS offered as a full-time two-year programme distributed in four semesters: three teaching semesters and a semester for research on a Final Master Project.

EMaCS is an Erasmus Mundus Joint Master Degree supported by the European Commission Erasmus+ Design Measures Programme that is offered to bachelors in Computer Engineering, Information Technology or related fields, who wish to increase their skills and abilities in the new competences demanded by the marketplace, through a practical, current and quality programme in computer science. The master's degree enables students to address a professional, researcher and educational (doctorate) future in five different issues related with Industry 5.0 and the disciplines in which each partner is an expert:

- Operational and Business Intelligence taught by UBU.
- Autonomous and Intelligent Systems taught by HAW.
- Cybersecure Systems taught by Turku UAS.
- Cloud and Edge Computing taught by UVT.
- Big Data Analytics taught by IPC.

The self-assessment report, the extensive programme materials before the site visit and on site and the conversations with highly motivated delegations have provided the panel with a comprehensive view of the programme. According to the panel, who based its assessment on the standards of the European Approach for Quality Assurance of Joint Programmes, the EMaCS programme fulfils all standards. Consequently, the panel assesses the overall quality of the programme as positive, with two recommendations to monitor during the implementation of the programme.

1. The review process

On behalf of the Erasmus Mundus Joint Master Degree Programme in Computer Science for Sustainable and Human-Centered Industry (EMaCS), the University of Burgos, which coordinates the programme, submitted its accreditation request following the European Approach for Quality Assurance of Joint Programmes on 15th June 2023.

The panel of reviewers was appointed on 16th November 2023 with the following composition:

- *President: Hans W. Nissen, Professor of Software Engineering. Technische Hochschule Köln (Germany).*
- *Secretary: Eva Fernández de Labastida Amurrio, Head of International Relations, UNIBASQ (Spain).*
- *Professional: José Luis Tribiño Fernández, Head of Coordination and User Service Area, DG Telecommunications, Junta de Castilla y León (Spain).*
- *Student: Cristian Augusto Alonso, Ph.D. in Computer Science, University of Oviedo (Spain).*

Short CV's of the panel members are provided in annex 12.1.

The review process was coordinated by Sonia Martin Cerro on behalf of ACSUCYL. All panel members signed a statement of independence and confidentiality.

The panel based its assessment on the Standards for Quality Assurance of Joint Programmes in the European Higher Education Area (EHEA) approved by the EHEA ministers in May 2015.

The panel members studied the application documentation of the proposed programme and reported on their preliminary findings. At the preparatory meetings the panel discussed the preliminary findings, identified the most important issues for discussion on site and prepared the sessions with the delegations.

The online site visit took place on 5 December 2023 via Teams. The panel discussed with the management of the consortium and the

programme, as well as with lecturers as this is an ex-ante procedure and the programme is not running yet. The schedule of the visit is available in annex 12.2. Annex 12.3 lists the materials made available by the programme either before or during the site visit.

Right after the discussions, the panel formulated its considerations and preliminary conclusions per standard. These are based on the findings of the site visit and build on the assessment of the programme documents.

The secretary then drafted the report and circulated it to all panel members for review and feedback. The comments of the members were incorporated in a final version, which was validated by the president on 14 December 2023, and by the ACSUCYL's Degree Assessment Commission on 19 December 2023. The draft report was sent to the EMaCS consortium for comments; the panel delivered a revised version of the report on 23 January 2024 after being validated by the president. The ACSUCYL's Degree Assessment Commission revised and validated this final report on 30 January 2024.

What I ratify, as president of the ACSUCYL'S
Degree Assessment Commission,

D. Enrique Amezua San Martín

2. Eligibility

2.1 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.

EVIDENCE

The Erasmus Mundus Joint Master Degree Programme in Computer Science for the Human-Centric and Sustainable Industry (EMaCS) is a master programme of 120 ECTS offered to bachelors in Computer Engineering, Information Technology or related fields, who wish to increase their skills and abilities in the new competences demanded by the marketplace, through a practical, current and quality programme in computer science. As stated in the SER, *“Its aim is to offer a programme that comprehensively contemplates a solid base dedicated to industrial computing for the advantageous processing and use of the massive data obtained from industry processes; a multidisciplinary approach that allows for deep knowledge of other areas of industrial engineering with which it intersects with the appropriate depth and; especially, an integrated vision of the aspects of sustainability, resilience and human-centric development that is fully integrated into the learning curriculum”*.

This new programme aims to start in the academic course 2025-2026 and does not have any students enrolled yet. The programme will be delivered jointly by five European universities: Universidad de Burgos (UBU, Spain), acting as coordinating institution, Instituto Politécnico de Coimbra (IPC, Portugal), Hochschule für Angewandte Wissenschaften Hamburg (HAW, Germany), Universitatea de Vest din Timisoara (UVT, Romania) and Turun Ammattikorkeakoulu (Turku UAS, Finland). All of them are recognised as higher education institutions by the authorities of their countries as stated in the SER

and evidenced by the legal documents of creation of each entity provided as annexes. In addition, there are some associated partners (Turku Science Park Ltd, University of Pardubice, State University of Maringá, Ca' Foscari University of Venice, Comercial MD, SL, and Michelin España Portugal, SA). All the Universities that are part of the master's degree can participate in a joint programme.

Each student who successfully completes EMaCS programme, as described in the SER and who has fulfilled the requirements of the applicable national legislations shall receive a Master's degree testified by:

- *A single diploma jointly awarded by UBU and UVT. It will be materially issued by the Coordinating Institution according to the applicable regulations and will carry the signature of the legal representatives of UBU and UVT. In addition, it will carry the name and official logo of all the Partners of the Consortium.*
- *A separately awarded diploma (in accordance with national provisions for the award of a master diploma) by HAW, IPC and Turku UAS, if the student has conducted 60 ECTS in the institution. This diploma will be physically or electronically issued by each Partner, accompanied by a certificate explaining that the student has completed the Erasmus Mundus Master Degree in Computer Science for the Human-Centric and Sustainable Industry (EMaCS).*

The diploma will include the specific specialty accredited by each Partner depending on the pathway chosen. The specialty granted will be defined for the institution where the student completes 60 ECTS, 30 ECTS of the course and 30 ECTS of the Final Master's Project as described in the following table:

	SEMESTER 1 (30 ECTS)	SEMESTER 2 (30 ECTS)	SEMESTER 3 (30 ECTS)	SEMESTER 4 (30 ECTS)	PATHWAY/SPECIALTY
1	UBU	HAW	Turku UAS	UBU	Operational and Business Intelligence
2				HAW	Autonomous and Intelligent Systems
3				Turku UAS	Cybersecure Systems
4		UVT	IPC	UVT	Cloud and Edge Computing
5				IPC	Big Data Analytics

Table 1. Specialties depending on the mobility pathways.

ASSESSMENT

The panel considers that the institutions that will offer the joint programme are recognised as higher education institutions by the relevant authorities of their countries. Their respective national legal frameworks enable them to participate in the joint programme. Each student who successfully completes the degree programme and who has fulfilled the requirements of the applicable national legislations will receive a joint Master's degree by UBU and UVT. In addition, a separately awarded diploma (in accordance with national provisions for the award of a master diploma) by HAW, IPC and Turku UAS will be awarded, if the student has conducted 60 ECTS in any of them.

The panel concludes that the standard is fulfilled.

2.2 JOINT DESIGN AND DELIVERY

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

EMaCS plans to take advantage of the knowledge and experience of each partner and associated partner to enrich the study programme. All partners are represented by different stakeholders (academic, technical and student) in the committees that manage the master's degree. The programme is managed through different joint governing bodies (functions are described in the SER and the Consortium agreement) as shown in the following figure:

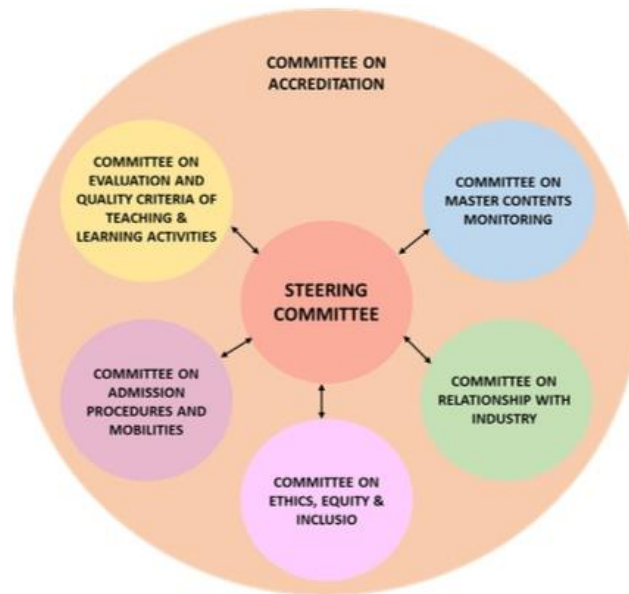


Figure 1. EMaCS governing bodies.

EMaCS includes two compulsory mobility periods with a workload of at least one academic semester (30 ECTS); one optional mobility for developing the Final Master Project and two compulsory journeys, the summer school and the graduation ceremony. The two compulsory mobility periods must be developed in two countries (different from the country of residence of the student at the enrolment stage) as can be seen in table 1.

ASSESSMENT

The panel considers, based on the available documentation and the interviews with the academic staff and the Steering Committee that the programme will be offered jointly, involving all cooperating institutions in the design and delivery of the programme.

The panel concludes that the standard is fulfilled.

2.3 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.

EVIDENCE

The Consortium agreement, as part of the documentation of the programme, includes:

- Legal framework;
- Degree programme (academic programme and semester structure detailing the different paths);
- the denomination of the degrees awarded in the programme;
- the coordination mechanisms and the roles and responsibilities of the partners involved regarding management and financial organisation;
- the admission and selection procedures for students;
- the mobility of students and academic staff;
- the examination regulations, student assessment methods, recognition of credits and degree awarding procedures in the consortium;
- Quality assurance (reference to the Internal Quality Handbook) and
- Publicity, awareness-raising and marketing

covering the requirements of the European Approach and the recommendations for EMJMD consortium agreement of Erasmus+ programme.

ASSESSMENT

The panel considers that the Consortium agreement covers adequately the terms and conditions to provide a joint programme.

The panel concludes that the standard is fulfilled.

3. Learning Outcomes

3.1 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).

EVIDENCE

The SER states that the programme is designed as *“a 120 ECTS joint master degree programme at Level 7 of the European Qualifications Framework (EQF), the Portuguese National Qualifications Framework (QNQ), the Romanian National Qualifications Framework (ROQF) and the Finnish National Framework for Qualifications (FiNQF). It is a Level 3 of the Spanish Qualifications Framework for Higher Education (MECU) and a Level 2 of the Qualifications Framework for German Higher Education Qualifications (HQR). It is a Level 7 of the International Standard Classification of Education (ISCED) of 2011 formulated by UNESCO and a Second cycle of the European Higher Education Area (EHEA).”*

The matrix of alignment with the Framework for Qualifications in the European Higher Education Area (FQ-EHEA) and the national qualifications framework is included in the Procedure for the evaluation of the student learning and the academic performance analysis (IQH-EMaCS-P04).

It also indicates that *“the basic skills, specific to the subjects that EMaCS includes, languages, sustainability, digital and lifelong learning that students will acquire upon successful completion of the degree, are collected together with the learning outcomes in Annex 3. Study, credit recognition and assessment regulations of the Consortium Agreement and the Procedure for the evaluation of the student learning and the academic performance analysis (IQH-EMaCS-P04) of the Internal Quality Handbook”*.

ASSESSMENT

The programme has defined:

- common competences for all students to establish a common profile of graduation;
- defined the number of competences and learning outcomes to ensure their achievement;
- related the competences with regulatory frameworks, subjects and entities through an alignment matrix.

From the review of the listed intended learning outcomes it seems that they correspond to level 7. The panel considers that the programme will provide to students a sufficient joint structure of learning outcomes assuring consistency among graduates.

The panel concludes that the standard is fulfilled.

3.2 DISCIPLINARY FIELDS

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

EVIDENCE

The competences and intended learning outcomes have been defined for each subject in the Annex I of the Consortium Agreement “Joint Course Syllabi” and are listed here:

1. Acquiring data, information and digital content
2. Browsing, searching and filtering data, information and digital content
3. Managing and evaluation data, information and digital content
4. Integrating and re-elaborating information and digital content
5. Programming
6. Using machine learning and A.I. techniques
7. Protecting personal data and privacy
8. Protecting health and well-being
9. Reflecting on ethical outcomes
10. *Exploratory and critical thinking*

11. Problem framing
12. Identifying needs and technological responses
13. Creatively using digital technologies
14. Solving technical problems
15. Managing systems and/or projects
16. Working with others
17. Communicating effectively
18. Collaborating through digital technologies

As stated in the denomination of the programme and its general aim, the programme's general goal is to offer an integrated vision of the aspects of sustainability, resilience and human-centric development that is fully integrated into the learning curriculum of industrial computing. During the online site visit, the Steering Committee explained that this is already integrated in the subjects and it was made more explicit in each of their files to further improve the clarity of the information provided.

ASSESSMENT

The list on competences and intended learning outcomes are aligned with the subjects offered in the different pathways. The aspects of sustainability, resilience and human-centric development are addressed in each of the subjects.

The panel concludes that the standard is fulfilled.

3.3 ACHIEVEMENT

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

EVIDENCE

The SER states that the student evaluation included in the programme has been designed to prove the achievement of the programme's competences and learning outcomes. The master programme has been designed to allow students to achieve all expected learning outcomes upon successful completion of the

master's degree. The outlined competences and learning outcomes are aligned to each subject in the syllabi.

The student evaluation process to ensure the achievement of competences and learning outcomes is described in detail in Annex 3 of the Consortium agreement. As stated during the online site visit, the academic staff will ensure that a continuous assessment takes place throughout the programme, by using different methodologies and tools.

ASSESSMENT

The panel is not yet in the position to establish whether the intended learning outcomes of the programme will be effectively achieved upon graduation, as it is a new programme and there are no students enrolled yet. Nevertheless, the panel is confident that the design of the programme is adequate to achieve the intended learning outcomes.

The panel concludes that the standard is fulfilled.

3.4 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.

Not applicable.

4. Study Programme

4.1 CURRICULUM

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

EVIDENCE

In the tables from the Joint Course Syllabi (Annex 1 of the Consortium agreement) the structure of the curriculum is shown; the content is further developed in the file for each subject also available in annex 1.

SUBJECTS BY UBU: Operational and Business Intelligence			
No.	Subject	ECTS	Type
EMaCS-01-01	Neural and evolutionary computation	6	Basic
EMaCS -01-02	Management information systems	6	Basic
EMaCS -01-03	Embedded systems and internet of things: architecture and devices	6	Basic
EMaCS -01-04	Consumer's ethical behaviour	3	Basic
EMaCS -01-05	Artificial Intelligence	6	Basic
EMaCS -01-06	Advanced methods in management engineering	3	Basic

Table 2. Subjects of the first semester.

All subjects of the first semester are compulsory and face-to-face.

The programme includes two compulsory mobility periods with a workload of at least one academic semester (30 ECTS); one optional mobility for developing the final master project and two compulsory journeys, the summer school and the graduation ceremony. It is a practical programme with several laboratory work subjects and optional internship periods.

The subjects of the second semester are offered by Hochschule für Angewandte Wissenschaften Hamburg (HAW) and Universitatea de Vest Din Timisoara (UVT) with 30 ECTS each. Each student must select one mobility between the offered institutions depending on the pathway chosen.

SUBJECTS BY HAW: Autonomous and Intelligent Systems			
Each student must select four elective subjects until complete 30 ECTS			
No.	Subject	ECTS	Type
EMaCS-02-01	Distributed adaptive systems	5	Elective
EMaCS -02-02	Mixed reality	5	Elective
EMaCS -02-03	Digital transformation	5	Elective
EMaCS -02-04	Process intelligence	5	Elective
EMaCS -02-05	Artificial intelligence	5	Elective
EMaCS -02-06	Predictive analytics and decision support	5	Elective
EMaCS -02-07	Advanced technologies in the Internet of Things (IoT)	5	Elective
EMaCS -02-08	Protocol engineering	5	Elective
EMaCS -02-09	Research workshop Lab I	10	Basic
SUBJECTS BY UVT: Cloud and Edge Computing			
EMaCS -02-10	Big data technologies	6	Basic
EMaCS -02-11	Cloud security	6	Basic
EMaCS -02-12	Industrial project	6	Basic
EMaCS -02-13	Multi-agent systems	6	Basic
EMaCS -02-14	Secure infrastructure management	6	Basic

Table 3. Subjects of the second semester.

The two compulsory mobility periods must be developed in two countries (different from the country of residence of the student at the enrolment stage).

The Summer School will be organised to bring together EMaCS student groups from the different universities to build a sense of community among them; to deepen in issues related to social justice, equity, and inclusion in computer world; to be in contact with the most innovative practices in this field at the European level; and to discuss their proposals for the final Master project.

The subjects of the third semester are offered by Turun Ammattikorkeakoulu (Turku UAS) and Instituto Politecnico de Coimbra (IPC) with 30 ECTS each. Each student must select one mobility between the offered institutions considering the pathway she/he wants to get at the end of the master's degree.

SUBJECTS BY Turku UAS: Cybersecurity Systems			
No.	Subject	ECTS	Type
EMaCS-03-01	Cyber threat intelligence	5	Basic
EMaCS -03-02	Defensive cybersecurity	5	Basic
EMaCS -03-03	Fundamentals of cybersecurity	5	Basic
EMaCS -03-04	Management and leadership of cybersecurity	5	Basic
EMaCS -03-05	Offensive cybersecurity	5	Basic
EMaCS -03-06	Operational cybersecurity	5	Basic
SUBJECTS BY IPC: Big Data Analytics			
EMaCS -03-07	Advanced topics in machine learning	7.5	Basic
EMaCS -03-08	Practice analytics	7.5	Basic
EMaCS -03-09	Thesis preparation	15	Basic

Table 4. Subjects of the third semester.

The optional internships might be developed in public and private collaborating entities of some host partners. The aim of the internship is that students apply and complement their academic training, favouring the acquisition of skills that prepare them for the exercise of professional activities, fostering their employability and entrepreneurial capacity.

The programme includes a mandatory Final Master Project (30 ECTS) in the fourth semester. With the supervision of a tutor and, if desired, co-tutors, all students enrolled will develop a Final Master Project in which they will demonstrate the advanced knowledge acquired during the Master. The theme on which the final master project will arise from the practices carried out and the institution chosen by the student and/or the contents of the laboratory subjects. The teaching guide of the subject will be common for UBU, UVT and Turku UAS whose national legislation allows to develop a jointly guide and it will be specific for HAW and IPC that have a more restrictive legislation. In this sense, the mobility at IPC in the third semester includes 15 ECTS of thesis preparation, which would make in practice a 45 ECTS master thesis, seems to be the regular practice at IPC.

ASSESSMENT

The panel considers that the proposed structure and content of the curriculum seem, in general, fit to enable the students to achieve the intended learning outcomes.

Half of the "Big Data Analytics" major (15 ECTS) is devoted to the "Thesis preparation". This is justified as a need due to the regulations at IPC, and the coordinators gave additional information about the way the topic would be covered. The panel is not particularly concerned about this but believes that this aspect should be monitored when the programme is implemented and should assure that the students receive enough information on the topic.

The panel concludes that the standard is fulfilled.

RECOMMENDATIONS

During its implementation the programme should monitor that the proposed curriculum offers enough content on Big Data Analytics to award a major on the topic, including the related contents on the subject "Thesis preparation".

4.2 CREDITS

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

EVIDENCE

To facilitate student mobility and the comparison of students' study attainment, the programme has adopted the European Credit Transfer and Accumulation System (ECTS). All semesters will be weighted according to the ECTS system and in conformity to Partners' national regulations.

The duration of the programme is two years (120 ECTS) and a complete academic course will be awarded with 60 ECTS credits.

As stated in the Consortium agreement, each partner formally recognises the subjects offered within the joint programme and the credits awarded. Partners accept differences in national regulations among them concerning awarding ECTS credits. All national marks obtained by enrolled students for courses completed at each partner will be converted to the ECTS scale according to the grade conversion table included in Annex 3. Study, credit recognition and assessment regulations of the Consortium agreement.

ASSESSMENT

All semesters will be weighted according to the ECTS system and in conformity to Partners' national regulations. The duration of the programme is two years (120 ECTS) and a complete academic course will be awarded with 60 ECTS credits, distributed in two semesters.

The panel considers that the European Credit Transfer System (ECTS) is applied properly and the distribution of credits is clear.

The panel concludes that the standard is fulfilled.

4.3 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.

EVIDENCE

The duration of the Degree Programme is two years (120 ECTS) and a complete academic course will be awarded with 60 ECTS credits, distributed in two semesters.

According to the European Credit Transfer and Accumulation System (ECTS), the workload of one ECTS credit corresponds to 25 to 30 hours of work. The workload quoted in EMaCS is calculated assuming 25 hours for consistency (each country has a different workload) and because it represents the typical workload associated with the modules in Europe. This workload is not only for class attendance but for all the other areas the student's academic activities could comprise up to a total sum of 25 workload hours completed in any of the following learning areas:

- Lectures and practical classes.
- Private study, on- or off-campus.
- Participation in seminars, assignments, practical work and projects.
- Preparation for and completion of examinations and assessment tests.

ASSESSMENT

This joint master has 120 credits teaching in two years. The last semester is dedicated to the master thesis.

The panel considers that the workload is evenly distributed on the 120 ECTS of the new master programme. The workload and the average time to complete the programme will be monitored through

students' satisfaction surveys as part of the internal quality assurance system.

The panel concludes that the standard is fulfilled.

5. Admission and Recognition

5.1. ADMISSION

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

EVIDENCE

The admission, selection and recognition procedure (Annex 2 of the Consortium agreement) includes the requirements (administrative, academic, job and language related) that candidates must meet to be considered to take part in the programme and the scholarships, as well as the selection process.

Regarding academic requirements, it is established that candidates should be in possession of, at least, a bachelor's degree (or its equivalent: 180 ECTS, minimum 3 years of study) in computer science, information and communication technology, computer science, electronics, telecommunications, software engineering, or media technology. Admission of candidates with other unrelated degrees will be considered here as long as they have successfully completed courses in programming, data structures and algorithms, software engineering, operating systems, or computer networks. It also includes knowledge and desired competences. In the case of job requirements, it is established that "At least two years (24 months) of work experience in the field of Computer Science, obtained after the completion of the bachelor's degree that can be verified by employment certificates, issued by the employer.

- Work experience is given in full months. When converting part-time work (work under 35 hours per week) into its full-time equivalent, 150 hours or 20 working days lasting at least 7 hours per day co-respond to one month of work. Work experience does not have to be continuous or obtained with the same employer.
- Entrepreneurship will also be accepted as work experience as long as the applicant provides a government certificate at the

local, regional, or national level, certifying proper registration and coverage under the pension scheme.”

Finally, regarding language requirements applicants from countries where English is not one of the official languages, must demonstrate proficiency in written and spoken English at a B2 (upper-intermediate) level of the Common European Framework confirmed by language certificates.

During the interviews, additional clarification was requested by the panel regarding the job requirements as two years of work experience could reduce the number of potential candidates. It was explained that it is a requirement to access a master programme for the Finish partner (Turku UAS).

The joint criteria for selection are summarized in the following table:

CRITERIA	SCALE
ACADEMIC ACHIEVEMENT AND POTENTIAL Adequacy of the academic background, grades and distinctions, participation in research projects, scientific conferences, publications, languages proficiency...	0-40
OVERALL QUALITY OF THE CV AND ACADEMIC AND/OR OTHER EXPERIENCE Other academic competences, professional and/or volunteering experiences in areas related with EMaCS, international experience...	0-30
QUALITY OF COVER LETTER Motivation, adequacy of the professional project...	0-20
RECOMMENDATION LETTERS	0-10

Table 5. Joint selection criteria (Source: Annex 2. Admission, selection and recognition procedure).

Under each criterion, there is a clear description of the different aspects, which will be considered, and the potential points, which can be achieved.

ASSESSMENT

The panel considers that the joint admission requirements and selection procedures are appropriate in light of the programme's level and discipline. The panel believes that the job requirements, even if it is regulated in Finland, might reduce the potential interested candidates, but it is necessary in order to follow the pathway in Finland.

The panel concludes that the standard is fulfilled.

5.2. 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.

EVIDENCE

Annex 3. Study, credit recognition and assessment regulations of the Consortium agreement establishes the conditions for Credit recognition for the Master. Each partner recognises the modules – credits offered within the joint programme.

In addition, this document establishes also the conditions for credit recognition/transfer from some other periods of study: "*Credits corresponding to achieved subjects studied in higher educational and official studies, in Spanish or foreign universities, whether or not they have been completed with awarding diploma, may be recognised by the Steering Committee if competences and learning outcomes achieve by the student on that subjects are similar to those of EMaCS.*"

ASSESSMENT

The panel considers that the Consortium applies fair recognition procedures to facilitate recognition of the modules and credits

awarded in the partner institutions and to facilitate access to the programme.

The panel concludes that the standard is fulfilled.

6. Learning, Teaching and Assessment

6.1 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.

EVIDENCE

The available documents describe the methodologies and activities designed to support the acquisition of competences and learning outcomes, using a varied array of methodologies. Each subject has a teaching guide that includes the most relevant information: Name of the subject, registration code, language / Semester, type of subject, number of ECTS, workload and tutoring hours / Content / Competencies and learning outcomes (knowledge, skills and attitudes/values)/ Teaching and learning methodologies / Evaluation criteria/ Previous requirements/ Responsible Department/ Lecturers/ Learning resources.

The programme includes varied teaching methods depending on the type of course: Lecture, Project based learning, seminars, directed discussions, research (Master thesis and internships), Demonstrating, Learning through guided activity and discovery, Inquiry-based learning, Active Learning/Learning by Doing, Action Research, Game-Based Learning/Gamification, Computational Learning, Context-Based Learning, Competency-Based Learning, Design Thinking and more (Annex 1 and 3 of the Consortium agreement).

Regarding the mode of delivery, the first three semesters will be delivered face-to-face (mobilities) and the last semester (Final Master Project) can be defined by the student in agreement with the project's director. The student will propose the study pathway in the application process, and it will be fixed, after the decision by the

Committee on Admission procedures and Mobility, on the Student Agreement.

The Committee on Ethics, Equity, and Inclusion will ensure the inclusion of all students.

ASSESSMENT

During the interviews the issue of how the aspects of sustainability, resilience and human-centric development are integrated into the learning curriculum was raised. The Steering Committee explained that this is already integrated in the subjects, and it is currently explicitly addressed in the denomination of the subjects or its contents.

The panel considers that programme is designed considering the alignment among intended learning outcomes, learning and teaching activities and assessment procedures to assure the achievement of the intended learning outcomes for all students.

The panel concludes that the standard is fulfilled.

6.2 ASSESSMENT OF STUDENTS

<p>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.</p>
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EVIDENCE

Assessment practices are designed in alignment with the teaching methodologies and are flexible, in accordance with different practices in different education systems. The consortium will adopt a continuous assessment system for all the subjects. The evaluation criteria are described in Annex 3. Study, credit recognition and assessment regulations of the Consortium Agreement and the evaluation procedure of each subject is fully described in the Joint Course Syllabi (Annex 1 of the Consortium agreement).

The assessment of each subject will be described by each lecturer, along with the objectives, methodology and competences at the beginning of the semester. The form of examination may be adapted to disabled students.

ASSESSMENT

The panel considers the examination regulations and the assessment of the achievement of the learning outcomes correspond with the intended learning outcomes and there are rules to be applied consistently among partner institutions. The documentation states that the procedure will rely on each institution's practices when a common approach could be beneficial. The EMaCS consortium has provided some additional harmonisation of the evaluation criteria which will benefit the programme, proposing objective criteria and offering some percentage range.

The panel concludes that the standard is fulfilled.

7. 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.

EVIDENCE

The Consortium agreement ensures the commitment of all partners to a very broad support of students: overall assistance to students and scholars visiting their institution, advice on matters such as accommodation, and assistance in case of illness, accident, or any other difficulties, specific support to obtain the required documents and information about the national immigration policy and, if needed, the assistance of students' travel for compulsory mobility.

Each partner is encouraged to include any available language courses and health insurance schemes to further support students with potential needs in these areas.

The facilities at host institutions must be adapted for different types of disabilities. The evaluation system also ensures inclusion of all students. It will be adapted to the specific needs of students with functional diversity, without this implying a reduction in the required academic level. The Consortium will ensure the accessibility of tools and formats, the web pages and electronic means of teaching will be accessible to people with disabilities. In the case of students with functional diversity or specific needs for educational support, any evaluation resource contemplated in the teaching guide must be adapted to their needs.

ASSESSMENT

The panel considers that the proposed student support services will contribute to the achievement of the intended learning outcomes and that they consider specific challenges of mobile students.

The panel concludes the standard is fulfilled.

8. Resources

8.1 STAFF

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

EVIDENCE

The documentation provided shows the CVs of 26 professors. Each institution has a coordinator and lecturers and researchers in several different disciplines. The participation of permanent staff and doctorates will be promoted, with a target of at least 80%.

In addition, the Consortium shall select and invite high profile experts in fields of relevance to the programme to act as guest lecturers. Roles of invited scholars and guest lecturers, selection procedures, modes of collaboration and financial conditions are specified in the document Annex 4. Guest Lecturers and Invited Scholars of the Consortium Agreement.

ASSESSMENT

The panel has reviewed the provided CV's and met some of the academic staff during the online site visit. In the interview with the Steering Committee the panel requested a clarification regarding the academic staff in HAW as four professors were included in all the subjects. The coordinator from HAW explained that these were the staff in charge of the subject and that additional staff would be available.

The panel considers that in general the staff proposed is sufficient and adequate, regarding its qualifications, professional and international experience, to implement the study programme.

The panel concludes that the standard is fulfilled.

RECOMMENDATION

When the programme is implemented a detailed description of the academic staff involved in the study programme in HAW including the professor in charge of each module should be available for the students.

8.2 FACILITIES

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

Together with the SER where the facilities in each partner institution are described, additional descriptions of the specific facilities of the partner institutions related to the EMaCS programme were made available as additional evidence.

ASSESSMENT

The panel considers that the available facilities are sufficient and adequate taking into account the intended learning outcomes. As stated in the documentation, all facilities have to be already adapted for different types of disabilities to facilitate inclusion.

The panel concludes that the standard is fulfilled.

9. 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.

EVIDENCE

All relevant information about the programme like admission requirements and procedures, course catalogue, examination and assessment procedures etc. will be available at the programme's website. The structure of the website draft was presented and it will have the following sections:

HOME

- *Welcome to EMaCS*
- *Why EMaCS*
- *Consortium*
- *Last news*

EMaCS

- *Consortium*
 - *Partners*
 - *Associated Partners & Collaborators*
- *Programme*
 - *Overview*
 - *Goals*
 - *Academic calendar*
 - *Structure*
 - *Curriculum*
 - *Syllabus*
 - *Internships*
 - *Final Master Project*
 - *Assessment*
 - *Continuous evaluation*
 - *Evaluation of merits*
 - *Grading system*

- *Evaluation of students with special needs*
 - *Degrees*
 - *Diplomas*
 - *Competences*
- *Joint activities*
 - *Welcome*
 - *Summer School*
 - *Graduation*

APPLICATIONS

- *Call for applications*
 - *Key dates and deadlines*
 - *Application management*
 - *Documentation requirements*
- *Fees & scholarships*
 - *Tuition fees*
 - *Erasmus Mundus scholarships*
 - *Other funding*
 - *Insurance*
- *Requirements*
 - *Administrative requirements*
 - *Academic requirements*
 - *Language requirements*
- *Selection & Admission*
 - *Eligibility check*
 - *Pre-selection process*
 - *Interviews*
 - *Appeals*
 - *Registration and enrolment*
- *Visa*

GUEST LECTURER

- *Call for applications*
- *Requirements*
 - *General requirements*
 - *Procedures*

- *Selection & Admission*

LIBRARY

SERVICES

- *Offices of international relations*
- *Special needs*

ASSESSMENT

All relevant information about the programme (admission requirements, procedures, teaching guides, scholarships, internships, etc.) will be available at the EMaCS website, as provided in written. The proposed sections will provide useful information in an organized manner.

The panel concludes the standard is fulfilled.

10. Quality Assurance

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

EVIDENCE

The Consortium has developed its own joint internal quality system, which is laid down in the Internal Quality Handbook as Annex 6 to the Consortium Agreement.

As stated in Section 6 of the Consortium Agreement, the Steering Committee is responsible for the overall quality and standard of the programme. It shall monitor the compliance of partners with the Agreement, and it shall be responsible for ensuring that the Degree Programme is delivered to the highest academic standards.

The Committee on Accreditation and the Master Contents Monitoring evaluating and Evaluation and Quality Criteria of teaching and learning activities Committees assist the Steering Committee in its quality assurance tasks and responsibilities, including, but not limited to, the carrying out of evaluations and the collecting of feedback from both staff and students.

A quality assessment report will be developed for each master edition by the Coordinating Institution, based on the feedback of all stakeholders of the Degree Programme. The report shall include course evaluation, the results and the analysis of the evaluation questionnaires from student, staff, partners, cross-partner survey analysis, the submitted unresolved complaints and valuable suggestions from students and alumni.

ASSESSMENT

The partners have jointly design and plan to implement their own joint internal quality system. The Steering Committee is in charge of quality assurance and will monitor the compliance of partners with the Agreement. The Committee on Accreditation and the Master Contents Monitoring evaluating and Evaluation and Quality Criteria of teaching and learning activities Committees will assist the Steering

Committee in its Quality Assurance tasks, including, but not limited to, the carrying out of evaluations and the collecting of feedback from both staff and students. The panel considers positively the development of a joint internal quality system.

The panel concludes that the standard is fulfilled.

11. Summary and Recommendations or Enhancement options

11.1 RECOMMENDATIONS

1. During its implementation the programme should monitor that the proposed curriculum offers enough content on Big Data Analytics to award a major on the topic, including the related contents on the subject "Thesis preparation".
2. When the programme is implemented a detailed description of the academic staff involved in the study programme in HAW including the professor in charge of each module should be available for the students.

11.2 RECOMMENDATION OF THE PANEL OF EXPERTS

The panel concludes that the standards are fulfilled. In the following table, an overview of the assessments is shown:

Standard	Assessment
ELIGIBILITY	Fulfilled
- <i>Status</i>	Fulfilled
- <i>Joint design and delivery</i>	Fulfilled
- <i>Cooperation agreement</i>	Fulfilled
LEARNING OUTCOMES	Fulfilled
- <i>Level</i>	Fulfilled
- <i>Disciplinary fields</i>	Fulfilled
- <i>Achievement</i>	Fulfilled
- <i>Regulated professions</i>	Not applicable
STUDY PROGRAMME	Fulfilled
- <i>Curriculum</i>	Fulfilled
- <i>Credits</i>	Fulfilled
- <i>Workload</i>	Fulfilled
ADMISSION AND RECOGNITION	Fulfilled
- <i>Admission</i>	Fulfilled
- <i>Recognition</i>	Fulfilled
LEARNING, TEACHING AND ASSESSMENT	Fulfilled
- <i>Learning and teaching</i>	Fulfilled
- <i>Assessment of students</i>	Fulfilled
STUDENT SUPPORT	Fulfilled
RESOURCES	Fulfilled
- <i>Staff</i>	Fulfilled
- <i>Facilities</i>	Fulfilled
TRANSPARENCY AND DOCUMENTATION	Fulfilled
QUALITY ASSURANCE	Fulfilled

12 ANNEXES

12.1 PANEL OF EXPERTS

Hans W. Nissen (President)

Hans W. Nissen graduated in computer science at the University of Passau (Germany) in 1991. In 1997 he presented his doctoral thesis at the RWTH Aachen, Aachen, Germany. He is currently Professor of Software Engineering at the TH Köln in Cologne, Germany. He has 20 years of teaching experience. His main research activities are: software and system architecture; software testing and verification; IT infrastructure in the Internet of Things and recently Artificial Intelligence for software engineering. He has more than 35 publications including books, journals and international conference proceedings. He runs a Bachelor's programme with more than 800 students and a Master's programme with more than 80 students.

In the last 20 years he was involved in multiple study programme accreditations in the role of responsible programme director. In addition, he participated in the evaluation of study programmes executed by Unibasq (Quality Agency of the Basque University System), Spain. In these evaluations he fulfilled the role of the International Member of the Engineering and Architecture Committee.

José Luis Tribiño Fernández (Professional)

Head of the Coordination and Customer Service Area of the regional public administration Junta de Castilla y León. Graduated in Information Systems Engineering from the Catholic University of Ávila and Technical Engineer in Computer Science from the University of Valladolid. He has an extensive professional experience since 1994, covering technological fields as analyst-programmer, project director, computer systems and networks technician, technical services coordinator, CIO in two SME and since 2000, his current position as a public employee. He currently works coordinating Service Desk, following ITIL standards and innovating in user-

oriented Big Data and AI issues. His area manages incidents and requests involving more than 65,000 public employees and almost 250,000 tickets per year. He has been collaborating with Acsucyl since 2018. (Spain)

Cristian Augusto Alonso (Student)

Ph.D. in Computer Science from the University of Oviedo, Spain. Currently enrolled as a doctoral candidate and actively engaged in cutting-edge research within the field of Software Engineering, with a focus on advancing knowledge in Software Testing. His doctoral journey complements my extensive academic background, which includes graduating with a degree in Computer Engineering in Information Technologies and earning a Master's in Computer Engineering at the University of Oviedo. He has also actively participated in various committees, contributing to the quality assurance processes of both the engineering school and the master's degree programme.

Eva Fernández de Labastida (secretary)

Head of internationalisation and projects at Unibasq- Agency for Quality of the Basque University System. Since 2009 she has been working at Unibasq, coordinating evaluation and accreditation procedures as well as quality system audits of the universities in the Basque University System, including the training of experts. Currently in charge of Unibasq's international activities in different networks such as INQAAHE, ENQA and ECA, mainly in matters related to joint programmes, academic recognition, employability and internationalisation. Since June 2017 she has been coordinating the ECA working group on "Mutual Recognition and Joint Programmes" has also participated in and coordinated international accreditations and the international evaluation of joint programmes in accordance with the European Approach for Quality Assurance of Joint Programmes.

12.2 SCHEDULE OF SITE VISIT

ONLINE SITE VISIT		
EUROPEAN MASTER IN COMPUTER SCIENCE FOR THE HUMAN-CENTRIC AND SUSTAINABLE INDUSTRY (EMaCS)		
5th December 2023		
Time	Activity	Attendees
13:00 – 13:45	Meeting with Teaching Staff	<p>UBU José Manuel Galán Ordax Professor in the field of industrial organization Virginia Ahedo García Assistant Professor Doctor</p> <p>Turku UAS Jarkko Paavola Dr. of Science in Tech., Executive Lecturer Vice</p> <p>UVT Adrian Spataru Lecturer of structures and Big Data Technologies</p> <p>IPC Mateus Mendes Adjunct Professor and researcher at the Institute of Systems and Robotics</p>
13:45 - 14:00	Disconnection pause	
14:00 - 15:00	Meeting with Steering Committee	<p>Universidad de Burgos Bruno Baruque Zanón EMaCS' coordinator and Coordinator Master's Degree in Business Intelligence and Big Data in Safe Environments Ainoa Barrón Carrancio EMaCS' Dissemination & Communication manager</p> <p>Turku UAS Päivi Oliva Advisor for Global Education at the Faculty of Engineering and Business Teppo Neuvonen Head of Education and Research, Master School, Faculty of Engineering and Business</p>

		<p>UVT Daniela Zaharie Professor at the Faculty of Mathematics and Computer Science</p> <p>HAW Zhen Ru Dai Prof. Dr. Vice-Dean for international affairs</p> <p>IPC Carlos Manuel Jorge da Silva Pereira Lecturer. Coordinator of the Bachelor in European Computer Science Engineering</p> <p>José Luís Nunes Professor</p>

12.3 LIST OF REVIEWED EVIDENCE

ANNEXES

1. Consortium Agreement

- *Annex 1: Joint Course syllabi*
- *Annex 2: Application, selection and admission procedure*
- *Annex 3: Study, credit recognition and assessment regulations*
- *Annex 4: Guest lecturers and invited scholars*
- *Annex 5: Multi-annual budget for the EMaCS implementation*
- *Annex 6: Internal Quality Handbook*
- *Annex 7: Student Agreement*
- *Annex 8: Diploma supplement*
- *Annex 9: Accession document*

2. Diploma

3. CVs

4. Legal documentation

5. Quality procedures

6. EMaCS facilities

7. EMaCS committees

8. Web-site structure

9. Example of student specialization

ADDITIONAL INFORMATION

1. Website draft structure

2. Additional description of the specific facilities

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