Micro-credentials in Construction

Baseline establishment on micro-credentials
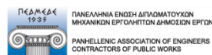
Project Information

Project number	101132905
Project name	Micro credentials in Construction Sector
Project acronym	Green Circle
Call	ERASMUS-EDU-2023-PI-FORWARD
Topic	ERASMUS-EDU-2023-PI-FORWARD-LOT2
Type of action	ERASMUS-LS
Granting Authority	EACEA/A/02
Copyright	This work is licensed under CC BY-NC 4.0
Project starting date:	1 December 2024
Project end date	30 Nov 2026
Project duration:	36 months
Project Website:	https://green-circle.eu/

Partners

1. **TECMINHO** – ASSOCIAÇÃO UNIVERSIDADE EMPRESA PARA O DESENVOLVIMENTO **(PORTUGAL)**

2. **ACP** - SYNERGASIA ENERGON POLITON - ACTIVE CITIZENS PARTNERSHIP **(GREECE)**

3. **PONTYDYSGU SL (SPAIN)**

4. **CICCOPN** - CENTRO DE FORMAÇÃO PROFISSIONAL DA INDÚSTRIA DA CONSTRUÇÃO CIVIL E OBRAS PÚBLICAS DO NORTE **(PORTUGAL)**

5. **CASAIS** - ENGENHARIA E CONSTRUÇÃO SA **(PORTUGAL)**

6. **UNIR** - UNIVERSIDAD INTERNACIONAL DE LA RIOJA **(SPAIN)**

7. **ARANSA** – ARANSA CONSTRUCCION Y OBRA CIVIL SA **(SPAIN)**

8. **VBB NORD** - VEREIN ZUR BERUFSFÖRDERUNG DER BAUWIRTSCHAFT NORD EV **(GERMANY)**

9. **PEDMEDE** - PANELLINIA ENOSI DIPLOMATOUCHON MICHANIKON ERGOLIPTON DIMOSION ERGON - PANHELLENIC ASSOCIATION OF ENGINEERS CONTRACTORS OF PUBLIC WORKS **(GREECE)**

10. **BNB** - BAUINDUSTRIEVERBAND NIEDERSACHSEN-BREMEN E.V. **(GERMANY)**

11. **DUTH** - DEMOCRITUS UNIVERSITY OF THRACE **(GREECE)**

1. General Introduction

Changes recorded in recent years on the organisation and functioning of economies, along with the significant development of technology, require a workforce equipped with modern knowledge and skills. This workforce must have the necessary flexibility and adaptability to rapid changes, laying the foundation for sustainable excellence. The speed of global development seems to be gradually pushing people towards quick and/or continuous education and retraining, known as Lifelong Learning, so that they can meet the constantly changing demands of the labour market. Consequently, a framework is emerging for seeking new educational opportunities of short duration, focused on acquiring specialised knowledge and/or skills, which are certified through MCs.[1]

MCs do not aim to replace traditional higher education obtained through a BSc, MSc or PhD degree. Rather, they have a complementary role, like that obtained with vocational education and training, allowing the achievement of specific learning outcomes (and therefore the acquisition of qualifications) in a shorter time frame (certainly much shorter compared to attending a traditional study program). It is also an alternative way to access university-level education for those who have not been able to enter a higher educational institution.

A MC demonstrates a competence that can be used in the labour market. "Micro" refers to a small or limited scope. Due to their small scope, MCs can be used to determine informally acquired competences or, after a targeted qualification phase of short duration, to prove "what has been learned or acquired" as part of an assessment, evaluation or examination.

A MC is not a partial qualification to prepare for a vocational qualification as in the Federal Institute for Vocational Education and Training in Germany (BIBB), *i.e.* an "external examination", in modules of 2-6 months over a total of 5, 6 or 7 partial qualifications. Nor does it refer to "adaptation qualifications" to establish the equivalence of a vocational qualification already obtained in a neighbouring country or third country to the corresponding occupational profile of a target country.

MCs in the academic field provide students with a strong link to the world of work and serve to develop special expertise. They are freely accessible within the framework of the open university and can also be credited to degree programs. Due to the accreditation of the universities and the embedding of MCs as elective or optional/compulsory modules in the curricula of existing degree programs, these are subject to the high-quality standards of the degree programs and can therefore be "marketed" or sold by the university or its "affiliated institutes" in a variety of ways.

MCs in vocational education and training (VET) refer to skills that are already usable on the labour market, without necessarily requiring a vocational qualification. It is certainly an advantage to have a certain amount of previous experience or at least corresponding "exposure" both when acquiring academically marketed MCs as well as MCs available on the "free market**.**

So, *what distinguishes MCs from traditional vocational or academic education and what is their actual potential?*

MCs are easily accessible and do not necessarily require a training, work or study relationship. They are intended to be utilised directly by all interested parties. This applies to both potential employees and employers. They also offer entrepreneurs an opportunity to up-skill in a way that they can manage and schedule for themselves, free from third-party specifications or demands. They are easy to

---

[1] McGreal, R., Olcott, D. A strategic reset: micro-credentials for higher education leaders. Smart Learning Environments. 9, 9 (2022). https://doi.org/10.1186/s40561-022-00190-1.

implement for training providers of all kinds. They can serve as proof of competence for learners who acquire knowledge via open educational resources (OER)**.**

According to a related report by the Organization for Economic Cooperation and Development (OECD), alternative credentials (*i.e.,* a term that includes MCs, digital badges and professional certifications) serve to bridge the existing gap between the knowledge provided by a traditional study program and the specific/specialised knowledge/skills sought by businesses. MCs also represent an approach that institutions can follow to address non-traditional students.[2]

Thus, higher education institutions, collaborative university schemes and large companies (*e.g.,* Microsoft and Toyota) have gradually started offering such educational opportunities (*i.e.,* courses that lead to the acquisition of MCs). It should be noted that the recent COVID-19 pandemic has contributed to the high demand for such courses**.**[3]

Table 1 outlines the key characteristics of MCs in terms of implementation method, duration to acquire, evaluation method, subject matter, type and the organisations that design and/or offer them.

Table 1. Characteristics of MCs.

Way of implementation	On site, online or hybrid
Duration	Hours or weeks
Evaluation	Attendance tracking, quiz, tasks or also exams
Object	General up to specialised skills and knowledge, cognitive up to non-cognitive skills
Type	Independent or in combination with other learning methods
Providers	Universities, companies, employers, other providers
Providers	Universities, companies, employers. Other providers

2. Definition of micro-credentials

For the purpose of analysis and correct understanding, the term MC has the following definition established by the Council of the European Union (EU) (2022):[4]

"*'MC' means the record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes will have been assessed against transparent and clearly defined criteria. Learning experiences leading to MCs are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs. MCs are owned by the learner, can be shared and are portable. They may be stand-alone or combined*

---

[2] Kato, S., Galan-Muros, V., & Weko, T. (2020). The emergence of alternative credentials. OECD education working paper No.216.

[3] Carnevale, A. P., Fasules, M. L., & Campbell, K. P. (2020). Workforce basics: The competencies employers want. Georgetown University Center on Education and Workforce, 1–72. https://cew.georgetown.edu/cew-reports/competencies/.

[4] Council of the European Union (2021) "European principles for the design and issuing of the microcredentials".

*into larger credentials. They are under pinned by quality assurance following agreed standards in the relevant sector or area of activity.***"**

MCs should be built on trust and transparency and include the mandatory and optional elements identified by the EU (2021)[5] shown in Table 2.

Table 2. Elements in MCs. Source: EU, 2021.[5]

Mandatory Elements	Optional elements
● Identification of the learner; ● Title of the MC**;** ● Country/Region of the issuer; ● Awarding body; ● Date of issuing; ● Learning outcomes; ● Notional workload needed to achieve the learning outcomes (in ECTS credits, wherever possible); ● Level (and cycle, if applicable) of the learning experience leading to the MC (EQF, QF-EHEA), if applicable; ● Type of assessment; ● Form of participation in the learning activity; ● Type of quality assurance used to underpin the MC**.**	● Prerequisites needed to enrol in the learning activity; ● Supervision and identity verification during assessment (unsupervised with no identity verification, supervised with no identity verification, supervised online or onsite with identity verification); ● Grade achieved; ● Integration/stackability options (standalone, independent MC/ integrated, stackable towards another credential); ● Further information.

To establish a successful MCs strategy, 10 key standards must be achieved. These standards define the nature of MCs and enable the development of a design and quality orientation for MCs. The EU (2022)[6] has defined these standards as follows:

1. Quality;
2. Transparency;
3. Relevance;
4. Valid assessment;
5. Learning pathway;
6. Recognition;
7. Portability;
8. Learner centred;
9. Authentic;

10. Information and guidance.

---

[5] European Union (2021) "A European approach to micro-credentials".

3. Micro-credentials in Europe

Typically, MCs cannot be considered a new practice, as VET have shown a long tradition of continuing professional development programmes and universities offer short-duration educational opportunities in some subjects compared to traditional study programs. Notably, professional-type MCs have been acquired in fields such as medicine and information technology. However, the idea of providing higher education in smaller educational packages dates back to 1975, and at the European policy level, the idea of offering short-term courses for workforce skill enhancement started in 2001.[6] Given the majority of alternative credentials available are offered online.[7] It is evident that the development of technology and the flexibility provided to learners have significantly contributed to the substantial growth of MCs. In the United States, numerous institutions (*e.g.*, MIT and SUNY) are active in providing this type of education. Additionally, various collaborative platforms like Coursera, edX and Udacity offer a significant number of courses.

Gradually, from 2000 onwards, many universities developed infrastructure to provide lecture material to their students. Examples include the Open Course Ware of MIT (2002) and the Open Yale Courses (2007). This created the need for a unified platform to gather all these resources. The previously limited interaction between learner and instructor was addressed by the first Massive Open Online Course (MOOC). A few years later, primarily higher education institutions and other bodies began creating course packages that led to the acquisition of relevant certifications (*e.g.*, micromasters, nano-degrees, etc.).

Since 2012, when Professors Andrew Ng and Daphne Koller from Stanford University created the platform Coursera and began offering three free online courses (which were named MOOCs), enrolments gradually reached 100,000 learners per course. Since then, over 900 universities worldwide have designed and offered such courses. Besides the major international platforms, the aforementioned Coursera, and edX which was founded in 2012 by Harvard University and MIT as a nonprofit organisation, several countries have created their own platforms. Some of these courses were offered for free including a final assessment while some others provided a certificate of approval through a minimum payment.

The European MOOCs Consortium has been developed, which includes the main platforms Future Learn, FUN, MiriadaX, EduOpen, and Openuped. These platforms offer approximately 3,000 MOOCs and represent a network of 400 institutions and businesses. The Consortium has developed the Common MC Framework (CMF), which is aligned with the European Higher Education Area.

It is estimated that there are at least 15,000 courses leading to MCs,[8] 75% of which fall within the scientific fields of management and technology. Over 220 million learners worldwide have taken at least one MOOC, and it is estimated that 40 million new learners enrolled in 2021 alone. The year 2020, influenced by the pandemic, was dubbed the second year of MOOCs, following 2012, which is historically considered the inception of the MOOC concept. Table 3 below illustrates the types of MCs awarded and the number of registered users on the two most popular educational platforms in 2021.

At the European level, as early as 2020, the *Rome Communiqué* on the progress of the *Bologna Process* saw 49 Ministers of Education recognizing the importance of MCs for a prosperous, democratic society

---

[6] Hudak, R., Camilieri, A.F. (2018) The Micro Credential Users` Guide. The Micro HE Consortium.

[7] Kato, S., Galan-Muros, V., Weko, T. (2020). The emergence of alternative credentials.

[8] Shah, D. (2021) Massive List of MOOC-based Microcredentials Over 1500 microcredentials from providers like Coursera, edX, FutureLearn, and Udacity https://www.classcentral.com/report/list-of-mooc-based-microcredentials/.

that promotes lifelong learning. Specifically, it is noted that the flexibility provided in choosing learning pathways to achieve learning outcomes is a key feature of both MCs and student-centred learning. Consequently, many institutions, beyond the traditional study programs they offer, have already designed and provided courses that allow learners to develop specific skills or acquire knowledge on a topic whenever they wish. Therefore, it remains to be explored how these courses leading to the acquisition of MCs can be developed, implemented, and recognized by institutions based on specific tools of the European Higher Education Area. Such tools include the qualifications framework, the European Credit Transfer and Accumulation System (ECTS), the diploma supplement, the Lisbon Recognition Convention, and the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG).[9]

Table 3. Types of MCs and Number of Registered Users on Popular Platforms in 2021. Source: Coursera, edX, 2021.[10]

Platform	Items MCs	Registered users (2021)
Coursera	Specialisation, Master Track Certificate, Professional Certificate	97 million (approx.)
EDX	XSeries, Micromasters, Professional Certificate, Professional Education, Microbachelors	42 million

MCs are also referenced in other sources, official documents or studies by the EU, such as: a) the European Skills Agenda,[11] which discusses a unified approach to supporting lifelong learning; b) the MICROBOL study,[12] which aimed to explore MCs as a means to improve the effectiveness and flexibility of higher education and to upgrade skills and reskill the workforce; and c) the European approach to MCs (2020),[13] one of the 12 flagship actions to support the quality, transparency, and acceptance of MCs in the EU. In the relevant study (the result of a special advisory working group aimed at proposing a common definition, a common European approach, and specific actions at the European level), there is a reference to the vision for 2030. A key point of this vision is the expansion of opportunities for European citizens to participate in higher education at any stage of their lives. The study highlights the possibility of short-term education and the fact that compliance with specific quality criteria will ensure the recognition of MCs by higher education institutions, employers, and other bodies. In this way, MCs will play an important role in achieving a society oriented towards lifelong learning and the improvement of all citizens.

---

[9] Ehea (2020) Bologna Process Rome Ministerial Communique.

[10] Shah D. (2021) Coursera's 2021: Year in Review. The Report: https://www.classcentral.com/report/coursera-2021-year-review/.

[11] The European skill Agenda: https://ec.europa.eu/social/main.jsp?catId=1223&langId=en.

[12] MICROBOL project: https://microbol.microcredentials.eu/.

[13] European Union (2020). A European approach to micro credentials: Output of the Micro Credentials Higher Education Consultation Group: https://education.ec.europa.eu/sites/default/files/document-library-docs/european-approach-MCs-higher-education-consultation- group-output-final-report.pdf.

4. The Green Transition and the Construction Industry

The EU construction sector, which undertakes the design, construction, maintenance, retrofitting and demolition of buildings and infrastructure, employs 6.1% of total EU workforce (12.7 million people), playing a key role in the European Green Deal (EGD) through building energy efficiency. The COVID-19 pandemic accelerated the need for the improvement of indoor air quality and thermal comfort as well as worker mobility and good conditions. With the adoption of green technologies and processes, there is a growing need for advanced and traditional skills. Over the next five years, 25% of the workforce needs upskilling or reskilling. The industry aims to attract more young people and women and promote lifelong learning.

The European Commission (EC) has been active in responding to the effects of Climate Change on society since the early years of the century. In 2010, the European strategy for smart, sustainable and inclusive growth, Europe 2020,[14] identified education and climate change as a headline action. More recently, in 2019, the EC EGD Communication[15] affirmed that tackling climate and environmental-related challenges are the defining task of this generation. The Green Deal, which has the goal of transforming the EU economy to create a sustainable future, has been described as a growth strategy to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy.

Renovation and improving energy efficiency of buildings is seen as key to the EGD. The construction, use and renovation of buildings require significant amounts of energy and mineral resources (e.g., sand, gravel, cement) that, according to the data received by the EC, are responsible – in EU buildings - for about 40% of the EU's total energy consumption, and for 36% of its greenhouse gas emissions from energy. The green transition is an opportunity and, at the same time, an urgency, as the European continent is witnessing more and more heatwaves, flooding and other extreme weather events. The construction sector can contribute with entrepreneurship and innovation to the creation of resilient cities and communities and to mitigating climate change. Constructing energy efficient buildings, shifting to renewable energy and resources and building climate-resilient, sustainable infrastructure are some examples of how the construction industry is working towards climate neutrality by 2050.

The United Nations Environment Programme has identified construction as a priority sector. According to the 2022 Global Status Report for Buildings and Construction[16], CO_2 emissions from building operations reached an all-time high of around 10 $GtCO_2$, around a 5% increase from 2020 and 2% higher than the previous peak in 2019. The report recommends actions for policymakers and decision makers, including that the sector should "*replace linear, non-renewable, toxic material processes with sustainable renewable materials that can sequester carbon and be managed sustainably over their life cycles. In parallel, for materials that cannot (yet) be replaced, their use and their carbon footprint should be reduced as much as possible*".

However, an economy based on such sustainable initiatives cannot be achieved without a workforce to support it. It is important both to prepare the workforce at large for the skills requirements inherent in green jobs and to ensure that the construction industry does not face a shortage of adequately skilled workers.

---

[14] European Commission, 2020 https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:en:PDF

[15] European Commission (2019): https://commission.europa.eu/publications/communication-european-green-deal_en.

[16] UNO (2022) 2022 Global Status Report for Buildings and Construction: https://www.unep.org/resources/publication/2022-global-status-report-buildings-and-construction.

Proactive re-skilling and upskilling are therefore necessary to reap the benefits of the European ecological strategy, and global initiatives. The European Parliament has adopted a recommendation for Member States to stimulate and support policies and programmes about learning for the green transition and sustainable development. This is crucial to ensure learners of all ages acquire the knowledge to live more sustainably, obtain the skills needed in a changing labour market and take action for a sustainable future. In 2022 this need was recognised, and the Council for the EU adopted a Proposal for a Council Recommendation on Learning for Environmental Sustainability.[17] Among other things, member states are recommended to establish learning for the green transition and sustainable development as a priority in formal, non-formal and informal settings.

The construction industry plays a pivotal role in the transition towards a circular economy. Historically characterised by high material consumption and waste generation, this sector presents significant opportunities for implementing circular principles, which can lead to substantial environmental, economic, and social benefits.

The Green Transition is only one of the challenges facing the European Construction Industry. The industry in Europe is facing severe skills shortages, affecting its growth and ability to meet current and future demands. The following challenges and trends have been identified:

- General Skills Shortages Across the Industry: There is an acute skills shortage across the construction industry in Europe, which is limiting growth. Difficulty in delivering projects due to these shortages is a common issue, with about 41% of construction companies citing this as a reason for a negative outlook on revenues. To combat this, there is a push to attract more young people to apprenticeships, especially in specialist professions such as conservation stonemasons, master joiners, lead workers, and gilders.
- Demand for Specific Professions: There is an increased need for professionals such as field engineers, superintendents, project managers, safety and quality managers, architects, and engineers. Recruiting younger generations is seen as vital for addressing these needs. There is a significant demand for building frame and related trades workers, building finishers, and painters or building structure cleaners.
- Impact of Technology and Sustainability: The industry is evolving with a focus on technology, sustainability, and people. Skills in areas like artificial intelligence, virtual reality, and off-site manufacturing are becoming increasingly in demand. Companies are also investing in training existing staff to meet these new demands.
- Gender Imbalance: The construction workforce is predominantly male, with only 2% of construction workers being women as of 2021. This suggests a potential area for increasing workforce diversity.
- Promote social inclusion: a MCs system can be used as an instrument of inclusion if they are specifically designed for certain vulnerable population groups (*e.g.*, people who are abused or marginalised due to gender issues or people with some special need).
- Replacing Retiring Workers: An estimated 4.1 million people will be needed by 2035 to replace workers retiring in addition to new job growth. This underlines the significant challenge of maintaining a skilled workforce in the long term.

---

[17] European Education Area (2022): https://data.consilium.europa.eu/doc/document/ST-9242-2022-INIT/en/pd.

- Industry Image Problems: The construction industry suffers from a poor reputation, which impacts the influx of new talent. Addressing this image problem is crucial for attracting new employees.
- Emerging Technology: The construction industry is increasingly adopting technology to improve efficiency and safety. This includes the use of drones, wearables, site sensors, and robotics. This shift requires new skills and training for the workforce.

Mobility in the construction industry is leading to pressure for mutual recognition of skills, competences and qualifications in the industry or for common qualifications, which can be underpinned by the ESCO occupational profiles and associated skills and knowledge. The European construction industry is facing a multifaceted skills shortage that includes a need for both general and specialised labour, a gap in technological and sustainability-related skills, and challenges related to industry perception and gender diversity.

According to data from the Eurostat Labour Force Survey shown in Figure 1, Spain, Greece and Italy are in the quadrant with the lowest competencies and skills in adulthood compared to other European countries and, at the same time, with the lowest use of training throughout life. The main purpose of the EU Educational Policy is to enhance the skill level of the population with greater use of training throughout life. Figure 1 is the result of combining data from the Survey of Adult Skills (PIACC) and Adult Education (EPA) Survey. The Survey of PIACC was conducted over three separate rounds between 2011 and 2018. The second cycle of the Survey of Adults Skills was conducted in 2022-2023. Nevertheless, the results are not available at the time of writing this document.
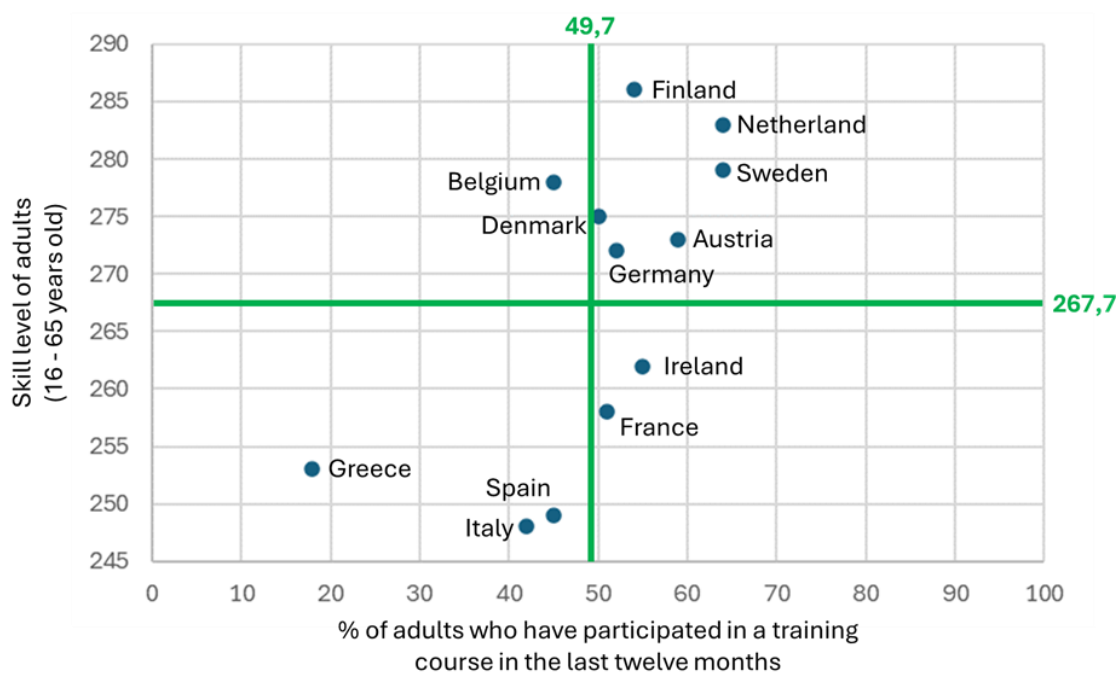

Figure 1. Skill level and participation in training courses in European Countries. Source: Data from Eurostat Labour Force Survey (2019) and PIACC (2019).[18]

---

[18] Eurostat Labour Force Survey (2019) https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey

Skills intelligence in the European construction sector is increasingly focused on adapting to green and digital transitions, with significant efforts directed towards upskilling the workforce, addressing skills shortages, and aligning training with the evolving demands of the industry. A closer alliance between education and enterprises for exchange of knowledge, particularly around different areas of innovation in construction, can lead to the development of new training programmes with a particular focus on new skills requirements stemming from the green and digital transformation.

The availability of short courses for upskilling around new materials and new approaches to construction, especially around green technologies, varies greatly from country to country. As an example, there are many programmes in Germany but few in Greece. Even where available, many of these carry no formal credentials and are external to the formal qualifications systems. Companies and individuals in the construction industry have for a long period of time addressed their skills needs, often outside the formal, state-managed systems and often working with equipment and material suppliers, due to these needs not always being met by formal education and training. While the quality of this training may be high, the lack of a formal certification system may reduce trust in the value of such training and work against mobility in the construction sector. The lack of formal recognition also raises concerns about coherence to regulatory standards for the green transition.

The following items briefly describe the different instruments to build the emerging infrastructure for qualifications in Europe:

- The European Qualification Framework

The European Qualification Framework defines a qualification as "*the formal outcome of an assessment and validation process obtained when a competent body determines that an individual has achieved learning outcomes to given standards*". However, it is noted that some countries are shifting away from traditional definitions of qualifications and opening routes towards what can be described as modern qualifications. Modern qualifications are more flexible in providing alternative pathways and flexibility, while adhering to the principles of modularisation and facilitating the validation of prior learning.[19]

- The European Skills Competences and Occupations

European Skills Competences and Occupations (ESCO) in early 2022, developed a model for identifying Green Skills and knowledge. The taxonomy (classification system) of skills for the green transition includes 381 skills, 185 knowledge concepts and 5 transversal skills considered most relevant for a greener labour market. These skills involve occupations in every sector of the labour market.[20]

- The European Learning Model

The European Learning Model (ELM) provides a unified system for describing all learning-related activities. This model facilitates the creation of digital credentials, crucial for recording and recognizing a wide range of learning experiences. [21]

- The European Digital Credentials

---

[19] CEDEFOP (2023) https://www.cedefop.europa.eu/en/projects/european-qualifications-framework-eqf#group-downloads

[20] ESCO (2022) https://esco.ec.europa.eu/en

[21] European Commision (2021) https://europa.eu/europass/elm-browser/index.html

A further approach to deliver new qualifications is the development of the European Digital Credentials. Using a common schema and metadata will potentially allow innovative approaches to the design and development of learning opportunities to be digitally included within the Europass.[22]

- Cedefop OVATE

A further part of the digital infrastructure is data from Cedefop OVATE.[23] The data is considered as vital for planning new programmes and to bring together employment providers and Public Employment Services within an emerging skills ecosystem. Skills intelligence can facilitate the identification of new skills and qualification requirements and to develop curricula designed to address the evolving demands of the labour market, fostering a skilled, resilient, and future-ready workforce.

As part of the activities for the European Year of Skills, on 24th April, 2024 the European Digital Credentials for Learning (EDCs) team organised a webinar. The webinar focused on exploring the connections between MCs and EDCs. Representatives from the EC gave an overview of the policy environment in which both MCs and EDCs operate. The session also detailed how the standard components of MCs, as outlined in the Council Recommendation on a European Approach to MCs, are integrated into the ELM. It explained how these elements can practically be used to issue MCs that comply with the Recommendation, leveraging the EDC infrastructure.[24]

Considering the previous section on MCs in Europe, the following sections provide a detailed description on MCs system development in each country partner of the Green Circle project: Spain, Portugal, Germany and Greece.

5. Micro-credentials in Spain

This section aims to outline the context for upcoming modifications that will regulate MCs. It will provide an overview of the country's situation, including the current and future state of the national qualifications system.

5.1 Introduction

MCs are not yet regulated in Spain. The Spanish educational system is divided into levels by age, institution, and programme duration. Among other institutions, VETs and universities could be MCs providers after secondary school. Figure 2 shows their place within the system.

Educational stages after compulsory secondary school are the following:[25]

- Upper secondary education is primarily provided in high schools and lasts for two academic years, typically for students aged 16 to 18. It offers two pathways:

  o Bachillerato (general option): Upon completion, students receive the Bachelor's diploma.

---

[22] Europass: https://europass.europa.eu/en/europass–tools/european–digital–credentials.

[23] Cedefop OVATE (2021): https://www.cedefop.europa.eu/en/videos/skills–ovate–database–presentation.

[24] Europass European Union (2024) https://europass.europa.eu/en/news/MCs–and–european–digital–credentials–learning.

[25] Eurydice (2024) https://eurydice.eacea.ec.europa.eu/national–education–systems/spain/overview

o Intermediate vocational training (vocational option): This option is also available in vocational training high schools, integrated vocational training centres, and national reference centres. Graduates receive the title of Vocational Training Technician. Those who wish to can continue their studies with intermediate vocational training specialisation courses, where available.

● Higher education includes university studies, artistic studies, and vocational studies:

o University studies are offered at universities and lead to Bachelor's, Master's, or Doctorate degrees.

o Higher artistic education is provided in higher artistic education centres, where students can earn Bachelor's degrees in Higher Artistic Education, Master's and Doctorate's degrees.

o Advanced vocational training is conducted in the same centres as intermediate vocational training. Upon completion, students receive the title of Higher Technician in Vocational Training. Graduates can pursue higher-level vocational training specialisation courses in professional families where these options are available.
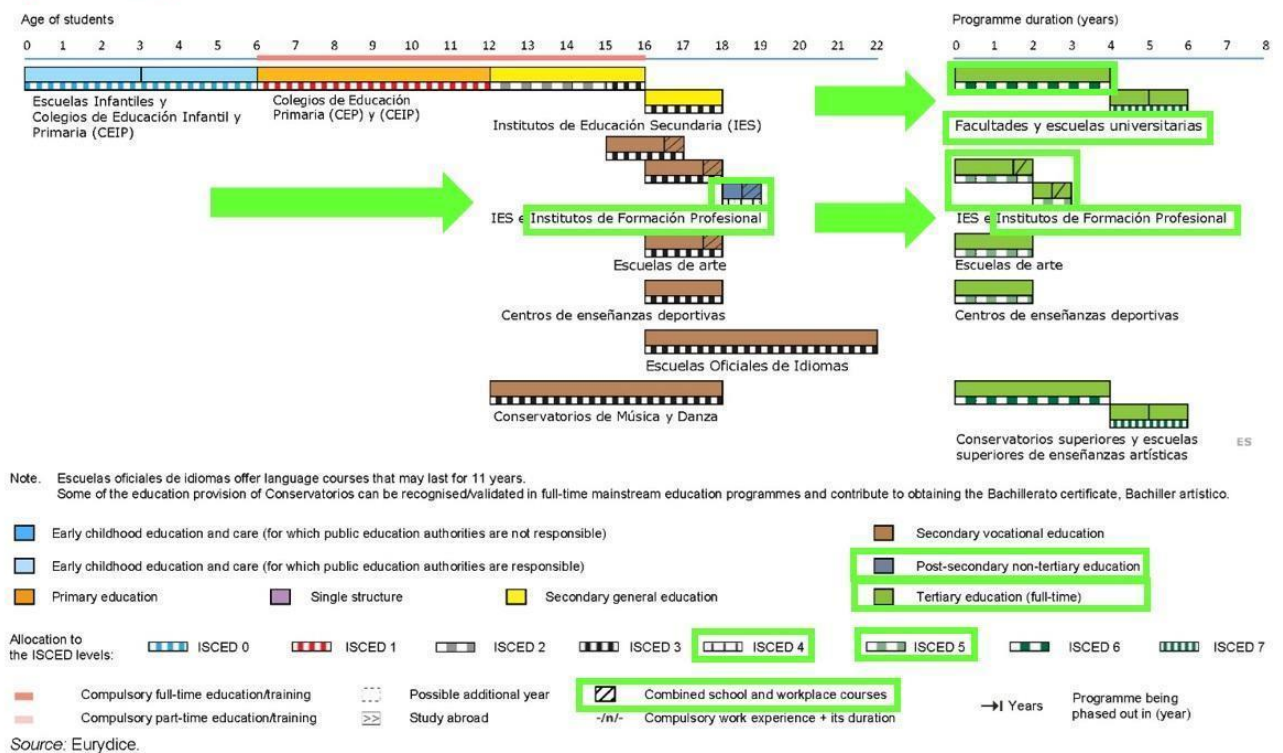

Figure 2. *The Spanish educational system: ages, levels and programme duration. Source: Eurydice.*

EPA encompasses various types of education offered by educational, labour, and local administrations in diverse institutions. Face-to-face education leading to official qualifications in the education system is provided in mainstream or specialised EPA institutions. EPA targets individuals over 18, and exceptionally those over 16 who are working, unable to attend regular schools, or are high-performance athletes. Additionally, the Spanish education system includes specialised education:

● Language education, covering levels A1, A2, B1, B2, C1, and C2 according to the Common European Framework of Reference for Languages (CEFR), provided in official language schools.

- Artistic education is offered in various specific institutions based on the type and level of education, including:

  o Elementary music and dance education

  o Professional artistic education in music, dance, or arts and design

  o Higher artistic education

- Sports education, organised into intermediate and higher training cycles, is taught in the same institutions as vocational education.

However, a significant portion of the active population has either low or high educational accomplishment, with a shortage in medium-level education. Currently, 45.84% of the workforce lacks accredited vocational education. The Spanish government forecasts that by 2025, the low-qualified workforce will decrease from 35% to 16%, the medium-qualified workforce will increase from 25% to 50%, and the highly qualified workforce will slightly decrease from 40% to 34%. In 2020, low-skilled workers experienced higher unemployment rates (22% compared to 15.8%) and lower employment rates (55.8% compared to 66.2%) than the average. High-skilled workers also struggled with employment due to a gap between the skills provided by the education system and those required by the labour market. Previous studies point out that the current system for identifying and predicting skill needs does not effectively align university education with market demands.[26]

The following sections outline the proposed definitions of regulations from education authorities, covering both vocational education and training as well as higher education, along with the initial framework designed by employment authorities. It is also crucial to gather perspectives on MCs from other stakeholders. Despite their differences, all definitions agree that MCs are evidence of the learning outcomes achieved by an individual after a brief learning experience.

5.2 Skills and qualifications frameworks

MCs hold significant relevance in Spain due to the high proportion of low-skilled adults and individuals with low employability. Employers seek more flexible training options and better alignment with the rapidly changing labour market. In response, three parallel processes to regulate MCs are underway in Spain, led by:

- VET
- Universities
- Employment authorities

The National System of Qualifications and VET (Organic Law 3/2022),[27] on Professional Training arrangement and integration) rules the competences for employment accomplished by formal and non-formal training or by labour market experience subjected to accreditation and acknowledgement, The National Institute for the Qualifications (INCUAL) organises VET educational provision through the

---

[26] González Gago, Elvira (2023). Case study Spain: Microcredentials for labour market education and training. First look at mapping microcredentials in European labour–market–related education, training and learning: take–up, characteristics and functions. Thessaloniki: Cedefop. https://www.cedefop.europa.eu/files/spain_microcredentials_mapping.pdf.

[27] https://www.boe.es/buscar/act.php?id=BOE–A–2022–5139#dd

National Catalogue for Professional Qualifications divided in three levels into 26 families which includes 776 qualifications for 2586 competence units (Figure 3).[28]

The Royal Decree 822/2021[29] regulates the Spanish university system. MCs are defined as short courses that provide less than 15 ECTS. These courses, aimed at lifelong learning, are designed to update or provide new skills and knowledge but do not contribute to a diploma. They are available to both graduate and undergraduate students of all ages. Unlike the Ministry of Education and VET, the Ministry of Universities does not classify MCs as part of graduate studies, so they do not count towards earning a graduate diploma. As mentioned in the literature review, there are available courses to obtain MCs at Spanish Universities (see Table 7).

Figure 3. National Catalogue of Professional Qualifications organisational levels. Source: modified from INCUAL.[30]

In the current system, the National Public Employment Service (SEPE) and the State Foundation for Employment Training (FUNDAE) manage non-formal, non-accredited training for employment, aligned with the Catalogue of Training Specialties overseen by SEPE.[31] This catalogue is regularly updated based on skills gaps identified by SEPE's Observatory of Occupations and FUNDAE's Sectoral Joint Committees. Presently, training addressing these gaps leads to accredited diplomas or attendance certificates. The SEPE Occupations Observatory leads the analysis of labour market trends, focusing on occupations and sectoral needs. It provides the National Employment System (SNE) and the country with a network of key informants and established methodologies to analyse the labour market's situation, trends, and training needs. This organisation investigates market demands for activities with significant presence or promising prospects, disseminating this information to form the basis of employment and training policies. It produces reports on the content of occupations, activity sectors, training needs, and employment-relevant groups. Notably, it publishes reports on occupational training needs, job offer profiles, labour market trends, worker mobility, and sectoral forecasts. Additionally, the Observatory is integrating AI into its tasks and enhancing the dissemination of information and

---

[28] https://incual.educacion.gob.es/bdc

[29] Boletín Oficial del Estado (2021) https://www.boe.es/boe/dias/2021/09/29/pdfs/BOE-A-2021-15781.pdf.

[30] INCUAL (s.f.) https://incual.educacion.gob.es/documents/d/extranet/cncp_listadoq_octubre_2024_-15_10_2024

[31] Ministerio de Trabajo y Economía Social (2024) https://sede.sepe.gob.es/FOET_CATALOGO_EEFF_SEDE/flows/main?execution=e1s1.

synergy creation with other observatories and processes. It coordinates with SEPE and FUNDAE in the Training Needs Detection process under the Recovery, Transformation, and Resilience Plan.[32] FUNDAE is a non-profit public sector foundation collaborating with the SEPE in vocational training for employment. Its goals include improving worker training, adapting workers and businesses to a knowledge-based society, and ensuring lifelong learning. It plays a crucial role in developing the MC system, bringing extensive experience in vocational training. Its tripartite nature involves unions and business organisations, participation from various government bodies, and input from sectoral collective bargaining committees in designing training processes. This, combined with its technical expertise and innovative capacity, makes FUNDAE, alongside SEPE, a key technical instrument for promoting the MC system within the SNE. Future reforms under Law 30/2015 will integrate MCs into the employment training system. MCs will be aligned with skills defined in the Catalogue of Training Specialties, which is more adaptable to emerging labour market needs than the Qualifications Catalogue. They will be obtained through existing training schemes for both employed and unemployed individuals, provided by companies and regional Public State Employment Service (PES). Details such as the duration, format, and issuing authority of MCs are still being defined. They are expected to be recognized by collective agreements, potentially influencing professional status and salaries. Industry leaders are likely to play a significant role as training providers, enhancing training quality and alignment with market demands. This system aims to complement rather than overlap with education and vocational training systems, although using the term "MC" across different systems may cause confusion among stakeholders.

Finally, the Spanish Qualifications Framework for lifelong learning (MECU) organises qualifications into five levels, from basic to complex. It includes general higher and vocational education, and training, covering both formal education and qualifications obtained outside the education system through work experience. The Royal Decree 272/2022[33] establishes the assignment of formal education qualifications to the framework levels, including the validation of non-formal and informal learning qualifications.

These procedures are complementary and each one employs different definitions of MCs to suit their respective systems. Despite these differences, a unified definition or framework could enhance understanding and trust in MCs. While the processes for integrating MCs in formal VET (both inside and outside the education system) and higher education are well advanced, the employment authorities' efforts to implement MCs in non-formal VET training for the labour market are less developed. However, it is crucial that workers and employers have access to an effective training system that meets their needs. Flexible, high-quality MCs could play a vital role. For the system to gain trust, it must align with existing mechanisms for anticipating and identifying skill needs, including feedback from companies. VET providers must adapt accordingly. Ensuring quality assurance, both program-based and institution-based, poses a challenge, especially given the wide range of training providers within the employment system.

5.3 Credit systems

The Royal Decree 659/2023[34] regulates the organisation of the Professional Training System. The accreditation for partial competences (art. 53) corresponds to Grade A according to the National

---

[32] Ministerio de Industria y Turismo (2024) https://www.mintur.gob.es/en-us/recuperacion-transformacion-resiliencia/Paginas/plan-recuperacion-transformacion-resiliencia.aspx.

[33] Boletín Oficial del Estado (2022) https://www.boe.es/buscar/doc.php?id=BOE-A-2022-7490

[34] Boletín Oficial del Estado (2021) https://www.boe.es/boe/dias/2021/09/29/pdfs/BOE-A-2021-15781.pdf

Catalogue of Professional Qualifications. Because of their workload equivalent to 15 ETCs, they could become micro-accreditations. Exceptionally, the Ministry of Education and Vocational Training may incorporate into the National Catalogue of Vocational Training Grade-A offers linked to non-formal courses made by the productive sector, provided they fall within the framework of the organisation of the Vocational Training System outlined in this Royal Decree and in the Organic Law 3/2022.[35] The assessment of partial competences corresponds to the Autonomous Communities with a national accreditation. After completing all the partial competences of a Competence Unit, the learner acquires a Grade B which accounts for a Competence Unit certificate. All these certifications become valid after being registered in the State Registry of Professional Training.

The recent update to Spanish university legislation (Royal Decree 640/2021)[36] refers to the creation, recognition, and authorization of universities and university centres, and the institutional accreditation of university centres. The Royal Decree 822/2021[37] which establishes the organisation of university education and the quality assurance procedure, together with the Organic Law of the University System (LOSU),[38] demonstrates a strong commitment to lifelong learning programs developed by universities. These programmes include their own courses, lifelong learning education, and specifically, MCs. According to the Royal Decree 822/2021, universities are authorised to offer their own lifelong learning courses in the form of MCs or micromodules of less than 15 ECTS, which certify learning outcomes related to short-duration training activities. As such, these courses can be recognized for credit towards obtaining an official degree, similar to the recognition of professional and work experience, considered as informal learning, through MCs.

Within the SNE, there are significant strengths for advancing the European approach to MCs, beyond the responsibilities of other educational system actors. Among the most relevant strengths, it can be found the State Register of Training Entities regulated by Order TMS/369/2019[39] outlines the processes for registering entities that deliver training specialties, including MCs, listed in the Catalogue of Training Specialties. It specifies the requirements for registration and the commitment to follow the prescribed training programmes. Its Annex I details necessary data for registration, such as centre identification, e-learning platforms, training specialties, quality indicators, and documentation for monitoring. The Register ensures transparency, is valid nationwide, and supports public and private providers in offering training. It can be enhanced with a database of companies providing subsidised training, focusing on social dialogue and sectoral collective bargaining agreements.

5.4 Digital credentials and quality assurance tools, with attention to gender aspects

The EU recommends Investigating the application of MCs in the European Education Area to address and challenge stereotypes related to gender and other forms of discrimination in educational choices, practices, and materials in the "European approach to MCs for lifelong learning and employability".[40]

---

[35] Boletín Oficial del Estado (2022) https://www.boe.es/buscar/act.php?id=BOE-A-2022-5139

[36] Boletín Oficial del Estado (2021) https://www.boe.es/buscar/act.php?id=BOE-A-2021-12613

[37] Boletín Oficial del Estado (2021) https://www.boe.es/buscar/act.php?id=BOE-A-2021-15781

[38] Boletín Oficial del Estado (2023) https://www.boe.es/buscar/act.php?id=BOE-A-2023-7500

[39] Boletín Oficial del Estado (2019) https://www.boe.es/buscar/doc.php?id=BOE-A-2019-4716

[40] European Union (2022) https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022H0627(02)

However, no mention of gender perspective was found in the VET and employment systems. Only the LOSU highlights that society has globally transformed through advances in science and technology, particularly in information and communication. Digitalization has become pervasive, and globalisation has deepened interdependence among nations and regions. Feminism has promoted gender equality, significantly by influencing education and leading to a predominantly female student population in universities. Environmental sustainability, climate challenges, and demographic shifts have gained prominence. International mobility has enhanced cultural exchange, by emphasising diversity and fostering creativity. Pedagogical approaches now integrate digital methodologies, reshaping education with a blend of distance learning and renewed emphasis on in-person interaction. Lifelong learning is increasingly valued alongside traditional youth education. The law also underscores gender, salary and handicapped equity as well as prevention of harassment, violence and discrimination, in regard with the Law 3/2022 on university coexistence.[41]

The Action Plan, published in the BOE in June 2021, outlines a comprehensive strategy for the National Youth Guarantee System, with participation from all 17 Autonomous Communities. It serves as the National Youth Employment Strategy, crucial for securing FSE+ funds aimed at youth employment and aligning with Sustainable Development Goals 5 and 8 of the UNESCO 2030 Agenda. The Plan encompasses 69 measures across six action axes: Orientation, Training, Employment Opportunities, Equal Opportunity in Employment Access, Entrepreneurship, and Institutional Framework Improvement. It specifically emphasises the Training axis, integrating recommendations for European MC approaches, particularly linked with the Youth Guarantee. Key measures within the Training axis (Measures 20-22, 25-37) include initiatives such as enhancing school-to-work transitions, fostering collaboration in training by business associations, strengthening occupational observatories, virtual training platforms, and sector-specific training programs (e.g., renewable energies, digital skills, rural tourism). Additionally, it supports integration through sports and leisure activities and promotes digital literacy workshops, among other efforts. The Plan is pivotal in guiding national efforts towards youth employment and skill development. The ESF+ joins four funding tools that were separate in the programming period 2014-20: the European Social Fund (ESF), the Fund for European Aid to the Most Deprived (FEAD), the Youth Employment Initiative and the European Programme for Employment and Social Innovation (EaSI**).**

The quality assurance of universities' own training programs, as well as official degrees, will be a shared responsibility among the administrations, quality assurance agencies, and the universities themselves. Universities are recognized for their ability to ensure the quality of their academic offerings (both official and their own) through their Internal Quality Assurance Systems (SIGC), which are certified by the agencies. According to Article 5 (sections 6 and 7) of Royal Decree 640/2021,[42] the National Agency for Quality Assessment and Accreditation (ANECA) has included MCs in its AUDIT-International program for the evaluation and certification of SIGCs, as stated in Article 10 (section 4) of Royal Decree 822/2021. The LOSU emphasises the university's role as a hub of innovation, a source of knowledge, material well-being, social justice, inclusion, opportunities, and cultural freedom for people of all ages. The university is recognized as the main producer and disseminator of knowledge, serving society by contributing to sustainable social and economic development and promoting an inclusive and diverse society committed to citizens' rights. This law particularly highlights pedagogical models that incorporate digital methodologies to foster autonomous learning and underscores the increasing

---

[41] Boletín Oficial del Estado (2022) https://www.boe.es/buscar/doc.php?id=BOE-A-2022-2978

[42] Boletín Oficial del Estado (2022) https://www.boe.es/buscar/doc.php?id=BOE-A-2022-2978

importance and social significance of lifelong learning for citizens as a complement to university education in youth, including MCs among the teaching modalities.

The Spanish Active Employment Support Strategy includes creating a Network of Centres for Guidance, Entrepreneurship, and Innovation for Employment as part of its focus on people and businesses. This involves establishing new Centres for Guidance, Entrepreneurship, and Employment Innovation (RD 818/2021).[43] Funded by the Next Generation EU funds, this network includes at least one centre per Autonomous Community, and in Ceuta, Melilla, and a state centre. The network supports evaluating guidance, job prospecting, and intermediation programs, fosters innovation in active employment policies, promotes entrepreneurship, and designs new personalised guidance models. It enhances the roles of employment guidance and self-employment assistance professionals through training, especially in digital transformation and new employment opportunities. These centres are ideal for implementing MCs, involving social partners for greater capacity, transparency, and reach to workers and businesses.

A unique personalised labour record is another initiative on digitalisation. The Spanish Active Employment Support Strategy 2021-2024 (RD 1069/2021)[44] was developed with the consensus of the 17 Autonomous Communities and input from social partners. It is a precursor to the new Employment Law, establishing elements that inspire the new generation of active employment policies: a people and business-centred approach, alignment with productive transformation, result-oriented services and programs, improvement of Public Employment Services capacities, and reinforcement of governance and cohesion within the SNE. Within strategic objective 4, "Improvement of Public Employment Services' capacities," the personalised single labour record is established as a measure to diversify service delivery channels of the SNE, ensuring continuous, personalised, and inclusive access. This personalised record will integrate historical data on individuals' employment situations from public employment services (demand, services received, training, contracts, unemployment benefits) and Social Security work life. It will be the natural basis for the future Individual Learning Account, which will include, among other training actions, MCs.

5.5 Highlights

MCs have significant importance in Spain, particularly due to a large proportion of adults with low skills and employability. There is a growing demand from employers for more flexible training options that can better align with the rapidly evolving labour market. Currently, Spain is undergoing three parallel processes to regulate MCs led by VET, higher education, and employment authorities.

These processes are complementary but differ in their definitions and roles of MCs within each system. Harmonising a shared definition or framework across these systems could enhance understanding and trust in MCs, despite operational differences. While formal VET and higher education processes are well advanced, the implementation of MCs in non-formal VET within the labour market by employment authorities is less developed yet crucial. It is essential for both employed and unemployed workers, as well as employers, to have access to an effective training system that meets their needs.

Stackable, flexible, and high-quality MCs can address these needs, but their integration requires alignment with existing mechanisms for anticipating and identifying skills gaps, including inputs from

---

[43] Boletín Oficial del Estado (2021) https://www.boe.es/buscar/doc.php?id=BOE–A–2021–15771

[44] Boletín Oficial del Estado (2021) https://www.boe.es/buscar/act.php?id=BOE–A–2021–20185

companies. Ensuring quality assurance, both at the program and institutional levels, presents challenges, especially given the diverse range of training providers in the employment system.

6. Micro-credentials in Portugal

In Portugal, there is little training offered that gives access to micro-credits, and there is limited documentation and information from authorities and companies. In higher education, through PRR (Recovery and Resilience Plan) funding, some universities and polytechnics offer microcredit courses with ECTS. The Portuguese partners did not find any offers of MC courses in vocational training.

In this section, the state of MCs in Portugal will be described, based on the research carried out and the experience of three Portuguese project partners. From the research carried out it was found that MC development practices can fit into the educational and training offer of higher education, regulated by Decree-Law 27/2021 of 16th April 2021, which adapts and modernises the incentive scheme for the cooperation of higher education institutions with the Public Administration and companies, and the Portuguese partners: CICCOPN — The Professional Training Centre for the Construction and Public Works Industry of the North of Portugal; TecMinho - The interface of University of Minho for innovation and training, which is also a training provider that offers short-term courses for the construction sector; and Casais, a large construction group that includes the Casais Academy, which provides in-house training for its employees and whose model is explained here, as it may be very compatible with MCs.

6.1 Introduction

From the research carried out, partners found that MC development practices can fit into the educational and training offer of higher education, regulated by Decree-Law 27/2021 of 16 April 2021, which adapts and modernises the incentive scheme for the cooperation of higher education institutions with the Public Administration and companies and support for the diversification of the training offer and lifelong learning.[45]

The decree-law identifies the important points of this policy as "*stimulating training offers based on collaborative, networked or consortium arrangements, diversifying and complementing the existing offer in areas where synergies between higher education institutions, public administration and business and industry prove to be most useful for deepening, updating and modernising people's qualifications, particularly in aspects associated with the digital and climate transitions underway, as well as anticipating and stimulating the processes of technological and social change emerging in Portugal, Europe and the world*". The aim is also to:

1. Increase the participation of experts from outside higher education institutions in the development of training and knowledge transfer activities, as well as in management positions.
2. Encourage modular higher education training, for example with MCs/micro-diplomas, which promote continuous learning and the acquisition of new skills, particularly in close collaboration with public and private organisations.
3. Promote innovative platforms, particularly by exploring distance learning methodologies, combining, and diversifying forms of teaching and learning, with self-learning and active methodologies; and

---

[45] Diário da República (2021) https://diariodarepublica.pt/dr/detalhe/decreto–lei/27–2021–161518656.

4. Extending the experience of diversifying and densifying the science and technology system to higher education, based on the growing success of setting up and strengthening Collaborative Laboratories and Technology Interface Centres, as a complement to R&D units and Associated Laboratories.

Article 4 describes the need to "analyse the supply and impact of short diploma courses, including MCs". The courses made publicly available (via websites) by universities and polytechnics in the construction sector use learning outcomes, and higher education accreditation and award diplomas based on ECTS (European Credits Transfer system), and as such are internationally recognized. They vary in length from 25 hours to 350 hours.

6.2 Skills and qualifications frameworks

Vocational training in Portugal is managed by ANQEP – National Agency for Qualification and Professional Training, which is supervised by the ministries of education and labour, solidarity and social security.[46]

The Portuguese National Qualification Framework (NQF) and the National Qualifications Catalogue (NQC) are managed by ANQEP and articulated with the European Qualifications Framework (EQF).

6.2.1 Vocational training certification

To obtain professional certification in the field of vocational training, the course must be provided by institutions certified by DGERT - Directorate-General for Employment and Labour Relations, or by centres under the direct/participated management of IEFP - Institute for Employment and Vocational Training I.P. (Public Institution) that is part of the Ministry of Labour, Solidarity and Social Security, however, without prejudice to the competences of competent sectoral bodies in regulated professions.

Accredited training institutions have access to a national platform, the SIGO platform, where trainees' records are kept with their total or partial certifications, directly linked to the NQC. These training programs are usually those financed by European funds.

The qualifications that exist at levels 2, 4 and 5 of the Portuguese Qualifications Framework, are organised by areas of education and training, corresponding to the labour market needs. Some of the qualifications respond to regulated activities/professions. The NQC is currently being revised, with the release of a new version planned for 2025.

The revision of the NQC for the Construction sector is ongoing and made by CICCOPN, in consortium with CENFIC - Vocational Training Centre for the Construction and Public Works Industry in the South of Portugal.

The 392 qualifications that make up the NQF include 110 NQF level 2 qualifications, 231 NQF level 4 qualifications and 51 NQF level 5 qualifications. It should be noted that NQF level 4 qualifications include: 172 qualifications with training frameworks organised in UFCD (short-term training units) of 25 hours and 50 hours in length; 3 qualifications structured in learning outcomes, according to the 2015 methodology; 56 qualifications resulting from the ordinances creating vocational courses, whose training references are not yet organised in 25 hours and 50 hours.

---

[46] ANQEP (s.f.) www.anqep.gov.pt

The NQC 392 qualifications are divided into 4011 Units of Competence (UC) and 8673 UFCD. UFCDs are short-term training programs lasting 25 or 50 hours and are awarded with 2.25 or 4.5 credit points, respectively.

UCs consist of a coherent combination of learning outcomes that can be autonomously assessed and validated with value for the labour market. The certification of a UC always counts towards the partial certification of the qualification(s) it is part of.
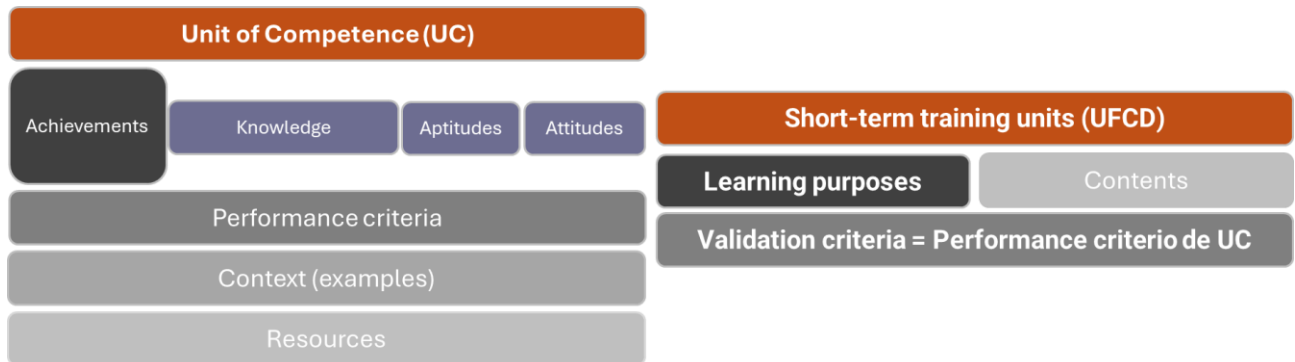
Figure 4. Elements that constitute UC (left) and UFCD (right). Source: Diário da República (2017).[47]

6.2.2 Training modalities

Based on the CNQ, there are various types of training, namely vocational courses, apprenticeship courses, education and training courses for young people (CEF), education and training courses for adults (EFA), and modular training, as well as the Recognition, Validation and Certification of Competences (RVCC). These programs have different target groups, divided into young people and adults. The lengths are also differentiated by modalities, levels of training (EQF levels 2, 4 and 5), and by whether they include school progression and/or only professional progression.

6.3. Credit systems

The research carried out indicates limited information and documentation on the offer of MCs in the professional context, whether through short courses in vocational education and training, or offers from training organisations certified by DGERT, business associations and companies.

In the research, we could not find any relevant documentation regarding the accreditation of short courses, such as 4-hour or 30-hour courses.

There are many organisations offering this type of training, but they do not independently award these MCs. We, therefore, believe that the Green Circle Project MCs for the construction industry will be a great stimulus for policy development and an open field for innovation and development, especially in the construction sector.

The training offer in Portugal can fall under the CNQ, especially when it is aimed at professional qualification (for example, the CICCOPN training offer), or it can be seen as short-term continuous/lifelong learning training aimed at updating skills (for example, the TecMinho's training offer), or it can be a training offer designed by higher education institutions in partnership with

---

[47] Diário da República (2017) https://diariodarepublica.pt/dr/detalhe/portaria/47-2017-106380301

companies (for example, the Casais Group's partnerships with the University of Minho and IPCA). Below is a brief description of these three types of training offer.

- **CICCOPN - Professional Training Centre for the Construction and Public Works Industry of the North of Portugal**

CICCOPN is the VET Centre for the Building and Public Works Industry of the North (Portugal), resulting from a protocol between the Portuguese Institute for Employment and Vocational Training (IEFP, Ministry of Labour, Solidarity and Social Security) and the Building and Public Works Industrialists Association (AICCOPN). CICCOPN target trainees vary considerably, from 15-year-old youngsters to adults aged 50 and more.

Along with training in more conventional Building-related areas, CICCOPN also invests in connected technical areas, such as renewable energies, renovation and restoration, as well as construction using traditional techniques and materials (this through several recent European projects).

Taking into consideration energy dependence in Portugal, all approaches leading to sustainable development (in terms of construction materials, renewable energies, etc.) are defended as crucial for the Portuguese organisation's present strategy. Interests are particularly in exchanging practices to develop the awareness of community stakeholders about the issues relating to the energy performance of buildings, both new and existing.

CICCOPN has vast experience in training in areas relating to the energy performance of buildings, namely thermal and photovoltaic solar panels, thermal behaviour of buildings and optimization of water usage, among others. CICCOPN is the major vocational training centre in the North of Portugal delivering courses in renewable energies relating to the Construction sector.

Within the CICCOPN current training offer that is provided according to the NQC, the most similar structure to MCs is the UFCDs that make up the NQC's qualifications references, but as mentioned above they have a workload of 25 hours or 50 hours, which cannot be changed. MCs should be sub-divisions of these UFCDs. In the work to revise the NQC, the UFCDs will disappear, only the UCs will remain, and under the new methodology that ANQEP wants to implement, the UCs will be developed in this way (see Figure 5)**.**
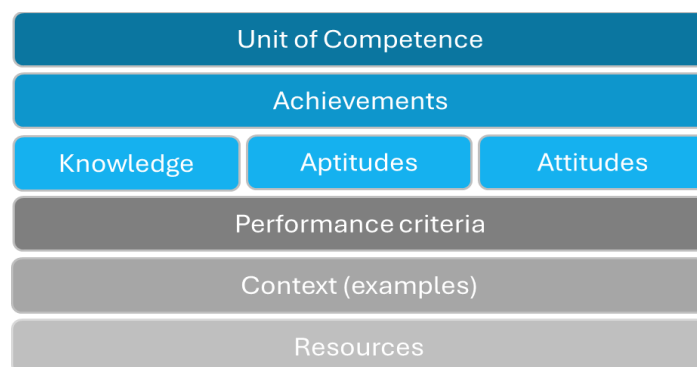

Figure 5. Units of Competence (UC) development.[48]

The achievements of each UC can be MCs as they are achievements/tasks that learners will have to know how to carry out, and the sum of these achievements will give them a certain general

---

[48] https://catalogo.anqep.gov.pt/ufcdPesquisa

competence. Because of the specificity that a company or organisation sometimes needs its employee(s) to have, only a fraction of the UC may be needed to fulfil this need, which is why MCs make perfect sense to be added to the Portuguese certification system in the future.

● **TecMinho's short training courses**

In response to vocational training and lifelong learning needs arising from the need for new professions and new skills, the modularisation of training programmes is a fundamental basis for a more flexible training offer, based on micro-skills and MCs.

Training organisations operating in the Portuguese market are certified by DGERT and follow its requirements, issuing certificates with this seal. TecMinho is one of these organisations, certified by DGERT, but also certified by quality standards: Quality Management (ISO 9001) and Innovation (NP4457), the Portuguese standard for Research, Development, and Innovation. Within the lifelong learning context, and like TecMinho, all training organisations certified by DGERT can offer tailor-made short courses that are not part of the CNQ. These are continuous training courses that are not aimed at obtaining a professional qualification but aimed at the market in order to fulfil specific training needs. It does not normally use the unit of competence or the UFCDs of the CNQ, since it is training tailored to the needs of the market and, in general, it is not funded by the ESF. The training offer is structured in short courses for different audiences and sectors of activity.

In the construction sector, there has been a consistent training offer over the years, either tailor-made for companies in the sector or open to professionals, employed or unemployed. These courses could be credited with MCs, since each one follows the principles of designing and developing courses based on learning outcomes and the acquisition of competences.

● **Casais Group training partnerships**

The following are examples of projects developed by external partners in which Casais Group collaborates or are clients and that refer to the development of projects were MCs or short courses with ECTSs that give credits to graduated workers from Casais Group:

o **The Alliance (University of Minho)**

The "UMinho Postgraduate Alliance - Skills for the Future" offers a portfolio of short courses geared towards the specific needs of the labour market and society. It was designed in close co-operation with a relevant group of employers and other external entities, with the aim of responding to the updating and retraining needs of professionals from various sectors of activity. The portfolio consists of 112 non-degree postgraduate courses, spread across the following educational programmes: Management and Business Innovation, Architecture and the Built Environment, Communication, Culture, Society and Inclusion, Engineering and the Manufacturing Industry, Social Protection and Integration, Health and Wellbeing, Environmental Sustainability and Territorial Management and Digital Transition.

The courses are aimed at graduates looking to improve their basic professional knowledge or develop professionally after graduation. Alliance students are eligible for scholarships funded by the project. Casais Group is a partner of this project in 4 training courses.

o **IPCA – Polytechnic Institute of Cávado and Ave (North of Portugal)**

Mais Futuro (Future Plus) is a programme aimed at final-year secondary school students wishing to enter the construction sector, who will have the chance to acquire practical knowledge and skills in a

real work context while they study. It is the result of a partnership between Casais Group and IPCA to design a course that responds to the needs of the market and the various specialties and businesses within the group. The entire programme and activities have been designed to reinforce the students' culture, values and alignment with the Group's strategy and objectives.

While acquiring knowledge on IPCA's Higher Professional Technical Course in Advanced Construction Technologies, they will also be able to experience real working environments and take part in various activities within the organisation. Each student will be assigned a tutor to monitor and guide their integration into a professional context until the end of their participation in the Mais Futuro Programme.

This course arises from the need to create a training offer that responds to areas linked to construction management and pre-construction, given the scarcity of training in the area, focusing on training areas from construction, specialities and ensuring that themes such as sustainability and industrialisation in the sector are addressed.[49]

o **Professional Retraining Projects**

With the aim of training and retraining people for the construction sector, the Casais Group, CICCOPN and IEFP joined forces to create professional retraining projects focused on new forms of construction, namely for the Blufab (a Casais Group company). As far as external partners are concerned, CICCOPN helped design the training programmes, while IEFP (Braga delegation) was responsible for disseminating and implementing the training. This partnership resulted in a training programme that includes 150 hours of classroom training, followed by 3 months of practical training in a work context at Blufab. In this way, Bluefab was able to focus the development of specific skills associated with working in series in a controlled and industrial environment, making construction more attractive and the learning process faster. In the two editions held, in 2021 and 2022, the initial phase of Blufab's activity, a hiring rate of 76% of trainees was obtained at the end of the practical training in a work context, for the role of Production Operator, ensuring the allocation of professionals with the necessary skills for the off-site construction context.

6.4. Digital credentials and quality assurance tools, with attention to gender aspects

MCs have gained traction in Portugal as a flexible and dynamic approach to education and skills development. These short, focused courses enable learners to acquire specific competencies that meet the evolving demands of the labour market. The integration of digital credentials and robust quality assurance mechanisms can ensure that these MCs are credible and widely recognized. Digital credentials can play a pivotal role in the future Portuguese MC landscape. They can offer a secure, verifiable, and portable way for learners to showcase their skills and knowledge. The EU's push for digital credentials, through initiatives like the Europass Digital Credentials, has been influential in standardising the format and ensuring interoperability across member states, including Portugal [50].

The digital credentials framework will ensure that MCs are stored in a tamper-proof digital format, making it easier for employers and educational institutions to verify the authenticity of the credentials.

---

[49] IPCA. https://etesp.ipca.pt/curso/tecnologias-avancadas-de-construcao/

[50] *Micro-credentials: an evolving discourse*. (2024). Eaie.org. https://www.eaie.org/resource/micro-credentials-discourse.html

This digital approach not only can enhance the credibility of MCs but also would support lifelong learning by allowing individuals to accumulate and share their achievements seamlessly.

Quality assurance is a cornerstone of the micro credential system. The European Association of Quality Assurance in Higher Education (ENQA) has outlined comprehensive guidelines to ensure the quality and reliability of MCs across Europe Higher Education. These guidelines emphasise the importance of transparent criteria, rigorous assessment methods, and continuous improvement processes[51] [52].

In Portugal, higher education institutions (HEIs) are required to adhere to these quality assurance standards to ensure that their MCs offerings are credible and meet the needs of learners and employers. This alignment with European HE standards helps prevent fragmentation in the education market and guarantees that Portuguese MCs are recognized and valued both nationally and internationally (Cirlan, 2023)**.**

Addressing gender aspects in the development and implementation of MCs is crucial for promoting inclusivity and equality. In Portugal, efforts are being made to ensure that training is accessible to all, regardless of gender. This includes designing courses that cater to the needs of women and encouraging their participation in fields where they have been historically underrepresented, such as STEM (Science, Technology, Engineering, and Mathematics).

Policies and initiatives aimed at reducing gender disparities include targeted outreach programs, scholarships for women in specific fields, and mentorship opportunities. These measures are designed to create a more balanced and equitable educational environment, ensuring that women have equal opportunities to benefit from the flexible learning pathways (*Micro-Credentials: An Evolving Discourse*, 2024) **.**

MCs in Portugal are evolving to meet the demands of a dynamic labour market, with the possibility of awarding digital credentials and stringent quality assurance measures ensuring their credibility and recognition. By incorporating gender-focused initiatives, Portugal aims to create an inclusive educational landscape that empowers all learners to succeed.

6.5. Highlights

In Portugal, Higher education institutions are promoting courses with MCs through European funding. The Decree-Law 27/2021 aims to modernise and diversify training offers by encouraging collaborations between higher education institutions, public administration, and businesses. This legal framework promotes continuous learning and adaptation to digital and climate transitions. Some universities and polytechnics promote MC courses, awarding ECTS credits, which are internationally recognised. These courses vary in duration and cater to the construction sector, among other fields.

On Vocational Training, there is a notable lack of training programs offering MCs as such. Vocational training is managed by ANQEP, with certified training institutions required to provide certified training. The NQC, which is currently being revised, includes short-term training units (UFCDs with 25 hours and

---

[51] Cirlan, E. (2023). Approaches to Quality Assurance of Micro-credentials A report on policies and practices to assure the quality of micro- credentials in the European Higher Education Area. https://www.enqa.eu/wp-content/uploads/IMINQA-MC-report_Approaches-to-Quality-Assurance-of-Micro-credentials.pdf

[52] OECD (2021), "Quality and value of micro-credentials in higher education: Preparing for the future", *OECD Education Policy Perspectives*, No. 40, OECD Publishing, Paris, https://doi.org/10.1787/9c4ad26d-en.

50 hours) that could be considered a pathway to MCs. The research found there is a lack of comprehensive information and documentation regarding the availability and accreditation of MC courses in the professional and vocational context. This gap presents an opportunity for projects like Green Circle to stimulate policy development of⌈ ⌉ᴵSEP⌋ Digital credentials and ensure the credibility and recognition of MCs.

The EU's initiatives, such as Europass Digital Credentials, help standardise and verify these credentials, supporting lifelong learning. In the Higher Education sector efforts are being made to ensure MCs are accessible to all genders. Initiatives include outreach programs, scholarships, and mentorship opportunities to encourage women's participation in underrepresented fields like STEM.

The expected evolving landscape of MCs in Portugal aims to meet the dynamic demands of the labour market. In the construction sector, in particular, MCs should close the gap between the need for skilled personnel and personnel shortage and the demand from construction companies. The integration of digital credentials, stringent quality assurance measures, and gender-focused initiatives are key to creating an inclusive and effective educational environment.⌈ ⌉ᴵSEP⌋ There are challenges in the future MC system in Portugal, particularly in vocational training, and there are also significant opportunities for growth and development through regulatory support, institutional involvement, and digital innovation.

7. Micro-credentials in Germany

In this section will be described the state of MCs in Germany, based on the research carried out and the experience of German partners, BNB – the construction industry association of Lower Saxony-Bremen e.V. and BBV Nord – the Verein zur Berufsförderung der Bauwirtschaft Nord e.V.

7.1. Introduction

Whereas universities in Germany already promote Lifelong Learning offerings issuing MCs to learners without being an enrolled student as prerequisite in various fields, leading to potential further study programmes or degrees, the professional training sector did not identify MCs as an urgent demand for skilled workers in the construction sector.

To be taken in consideration is the fact that removal of artificial barriers between academic and vocational education has been in the political agenda for quite some time, but wasn´t enforced by policy makers. Nevertheless, some universities have excellent offers already in place offering MCs to develop green skills, accessible by anyone which have been developed in cooperation with private training providers or other stakeholders.[53]

There are also other examples for MCs for skill-development, especially in highly innovative areas such as coding, AI or design technologies, which could offer a framework or ecosystem that might work as well for MCs in construction.[54]

---

[53] Universitat Oldenburg (s.f.) https://uol.de/c3l/flow

[54] https://hochschulforumdigitalisierung.de/news/neues-diskussionspapier-des-ki-campus-zu-MCs-und-micro-degrees/
https://ki-campus.org/sites/default/files/2023-02/2023-02_Discussion_Paper_MCs_Micro-Degrees_AI_Campus_EN.pdf

All or most examples unfortunately do not include practical or site-related training methods, which are crucial for competence development appropriate for site-work.

Vocational training in construction is embedded in the Dual System, very complex and diversified resulting in a lot of different and specialised occupations in the construction sector itself.

The dual system for a current total of 324 occupations in Germany is regulated at state and federal level by the respective training regulations in the Vocational Training Act (BBIG). In addition, further training can be implemented at state level via examining chambers (HWK/IHK) and recognized at federal level via a further training regulation or regulated directly at federal level via the BBIG. Many training opportunities at chamber level ultimately led to an amendment of the BBiG in 2019. Sections 53a-d BBiG identify three levels of further training in the German Qualifications Framework (DQR). These are always based on completed vocational training with corresponding specific professional experience. The further training levels describe the competences to be achieved and proven at the respective level as well as the minimum required scope of learning. These are:

- Certified professional specialists with at least 400 hours of learning (DQR 5)
- Bachelor Professional with at least 1200 hours of learning (DQR 6)
- Master Professional with at least 1600 hours of learning (DQR 7)

The Master Professional can only be acquired if a Bachelor Professional has already been obtained.

SOKA-BAU is an important institution in the German construction industry, consisting of two organisations: the **Holiday and Wage Compensation Fund of the Construction Industry (ULAK)** and the **Supplementary Pension Fund of the Construction Industry (ZVK)**. Both organisations work closely together to provide services for employers and employees in the construction sector.

Here are the key tasks and functions of SOKA-BAU:

- **Holiday and Wage Compensation**: The ULAK ensures that construction workers can claim their holiday entitlements even if they frequently change employers. In the construction industry, short-term, project-based employment is common, making it difficult to accumulate vacation days. SOKA-BAU centrally manages and compensates these holiday entitlements.
- **Pension Provision**: The ZVK handles occupational pension plans for construction workers. Employees accumulate claims for additional pension benefits during their employment, which are managed by the ZVK and paid out upon retirement.
- **Securing Social Standards**: SOKA-BAU helps maintain social standards in the construction industry. It provides support in cases where companies go bankrupt or fail to make their contributions. By centralising contributions and services, it ensures that the working and social conditions for construction workers are safeguarded.
- **Financing and Contributions**: Construction companies are required to make contributions to SOKA-BAU. These contributions go into various social funds from which the described services are financed.
- **Support for Vocational Training**: SOKA-BAU also promotes vocational training in the construction industry. It provides funding to cover training costs and ensures the quality of apprenticeship programs.

Overall, SOKA-BAU is designed to address the specific working conditions and requirements of the construction industry, ensuring standardised social benefits for workers. Both employers and employees benefit from this system, as it facilitates workforce mobility while ensuring social protection.

SOKA-BAU is funding a total of 17 professions in main construction whereas secondary contract works such as roofing, plumbing or electricity is not part of the funding system.

Bau-ABC Rostrup is a private and non-profit independent training provider for the construction industry. It provides inter-company training in 23 professions in the construction value chain and is monitored by SOKA-BAU as contracting authority for an independent audit by an accredited certification body.

Up until today, SOKA-BAU is not designed to enable continuous training for employees in the construction sector. It is advisable to find out if SOKA-BAU is also interested in promoting continuous training for the industry. MCs could be a format to ensure employability within the industry itself to a point that there is no loss of staff, which is in consequence stability in the funding-system.

Bau-ABC Rostrup is also certified in accordance with AZAV and DIN EN ISO 9001:2015 for further vocational training or classic advanced training in accordance with BBIG. As part of certificated courses, there is also further external monitoring for individual industry sectors such as gas, water, geothermal energy, subsoil, geotechnics, TRGS, concrete or machine operation, for which registered certificates are issued following standards and regulations for technologies. There are even published standards or regulations for application training itself available or at least rules and regulations that describe specific requirements for personnel on the construction site. Some of the rules and regulations have been recently transferred to European standards. European standardisation in construction is offering new opportunities for recognition of MCs based on standards.

There is a huge compendium for safety and health regulations (*e.g.*, DGUV, BGBAU, BGR) with a complex training system and certificates being issued and reissued for the construction sector. Nothing could be established on a European level since these trainings are usually very short-lived and mostly closely related to the individual working environment that is of course very individual on each construction site. General training to a certain level or machine operating safety certificates could be used European-wide if recognition can be enabled through a common framework.

7.2. Skills and qualifications frameworks

Most offered courses in continuous training of the construction sector relate to level EQR 3 - 6, there is rarely anything offered for level 1 or 2 because this is being covered up to level 4 by the apprenticeship system already. Skills are usually related to already existing occupations; therefore, most courses require extensive work experience or a professional degree. Training providers offer a wide range of courses which take place in presence. Online or e-learning is an absolute exemption.[55]

---

[55] www.bauakademie–nord.de

https://bauakademie–nord.de/uebersichten

A closer look reveals that almost all training courses in the industrial-technical sector are directly or indirectly monitored. These are qualifications that are necessary due to company pre-certifications as proof of required personal qualifications to be able to participate in the competition as a contractor.

Currently there is a low demand to identify or verify the DQR or EQR Level of Certificates or qualifications, because employers are financing courses to keep well-trained staff in their own entity, mobility is not required or wanted. The request from individuals is much stronger here. Training providers could include information about EQR or DQR level easily if the MC framework requires it.

Interestingly there is rarely any centralised skills monitoring or job-title protection for construction site managers. The competence of the site-manager is resulting from a high previous qualification by studying or advanced further training of special skilled workers. There are almost exclusively one-day courses offered, that are attended by site managers from vocational or academic backgrounds to acquire or refresh the necessary skills for the world of work.

All other qualification courses are already monitored by third parties, access criteria, content and learning objectives are defined, and the necessary test certificates are prescribed.

In the context of advanced training, it should be noted that the foreman, plant foreman and certified foreman courses have been regulated by the social partners of the construction industry (construction trade, construction industry and IGBAU) and only the certified foreman (industrial foreman construction) has been recognized by the BBIG but has not yet been "transferred" to the Bachelor Professional.

7.3. Credit systems

There is already a wide range of training courses with a time range of 8 hours up to 15 days (<120 hours), which would meet the criteria of micro-certificates, but is used more for quality assurance and market regulation or limitation. In addition, they are used for "release from liability" in the event of possible claims, so that both personal and property insurance cover applies. Otherwise, companies will not be able to prove beyond doubt that they have carried out the prescribed preventive training or instruction, or that they have imparted the necessary skills for an assignment.

However, the regulatory qualification mechanisms described above do not provide individuals with low-threshold market access to the construction industry, as these are personal qualifications that are largely required for the "core workforce" of companies, *i.e.* for individuals who are already employed in the industry.

This makes it clear that the MCs defined before are completely new educational offerings that have not yet arrived in the construction industry, at least not in Germany. It is therefore important to explicitly work out the potential of MCs for the construction industry and to create offers that can be utilised in a targeted manner.

For example, the aim here is to use MCs to attract auxiliary staff or career changers to the industry, to provide academic specialists with access to the construction industry and to offer new "green skills" for companies or individuals who are interested in implementing sustainability, the energy transition, climate targets, etc., or who would like to develop this as a new business area. It is also important to convey the system and solution relevance of this sector for achieving the 17 goals of the EU Charter as such to cultivate the image and recruit new talent in the sector. These are important approaches for the piloting of new MCs, which are then promoted accordingly.

Representatives of employers' associations in Germany put it in a nutshell: "*Micro-diplomas are proof of practical, flexible, retrievable experience and short training periods. Common European standards must preserve this attractiveness and must not restrict micro-diplomas through over-regulation and excessive formalisation. It is therefore crucial to find the right balance between promoting trust and transparency within a common approach, without compromising the flexibility of MCs.*[56]

The previous statement in turn opens important approaches for the issuance of MCs. To prevent restrictions due to over-regulation and excessive wording, it would be conceivable to verify and register MCs only via a central digital verification point, similar to the Europass or the mobility certificate, so that educational institutions only refer to the possibility of issuing a MC certificate at the relevant point for their new and suitable educational offers. Educational institutions can "label" their offers according to the comparison of the certificate of participation and the criteria for issuing or registering as a MC is then only carried out digitally for the whole of Europe at a central location.

In regard to the European-wide skills-shortage in the construction sector, it might be worthwhile to consider all existing courses in construction, which are not part of BBIG or the Dual System in Germany, as potential MCs on a European level.

7.4. Digital credentials and quality assurance tools, with attention to gender aspects

The implementation of digital credentials is a key component of the MC ecosystem. Digital certificates, accessible through platforms like Europass or blockchain-based systems, ensure the authenticity, portability, and security of credentials. These tools allow learners and professionals to showcase their skills in a verified and transparent manner, while employers can easily assess the credibility of qualifications. Digital credentials also enable continuous learning, empowering individuals to update and maintain their skills in line with the rapidly changing demands of the labour market.

In terms of quality assurance, several mechanisms are essential. First, the alignment of MCs with NQFs and European standards ensures their recognition across borders. Additionally, centralised digital platforms for storing and verifying credentials, like those proposed in Germany, can prevent over-regulation while maintaining transparency. This central registry could offer both a verification mechanism and a tracking system for lifelong learning, ensuring that credentials are relevant, up-to-date, and accessible to all.

When considering gender aspects, it's critical to address the barriers that women face in traditionally male-dominated fields like construction. MCs can play a role in addressing gender imbalances by offering flexible learning pathways that allow women to enter, upskill, or reskill in sectors where they are underrepresented. Moreover, by making the credentialing process digital, these opportunities become more accessible to those balancing work, family, or other responsibilities, often a challenge disproportionately faced by women.

Additionally, efforts should be made to design MCs that focus on gender-sensitive skills such as leadership, negotiation, and project management in male-dominated industries. Ensuring that the

---

[56]CEDEFOP(2024)
https://www.cedefop.europa.eu/files/01._session_1_microcredentials_for_labour_market_education_and_training_-_a.pouliou_j.bjornavold_g.kirdulyte.pdf

language and marketing of these credentials appeal to a broad audience and reflect inclusive policies is also essential. Incorporating gender-sensitive quality assurance—through diverse participation in curriculum development, and unbiased assessment methods—can contribute to making MCs a tool for promoting gender equity in the workforce.

7.5. Highlights

MCs represent a promising innovation in the German education system, offering flexible, targeted, and accessible qualifications that align with labour market needs. However, the implementation of these credentials within Germany's highly regulated and structured vocational education system presents both challenges and opportunities. While MCs offer the potential to fill gaps in traditional education by focusing on specific skills and competencies, they must be integrated in a way that complements existing qualifications rather than undermining them.

The digitalization of credentials plays a crucial role in this integration. Digital tools not only ensure the authenticity and transparency of credentials but also allow for broader access and flexibility. These tools can be especially beneficial for promoting lifelong learning, helping individuals to stay relevant in an evolving job market.

Moreover, attention to gender equality in the development and implementation of MCs is essential. By providing flexible learning opportunities and addressing the specific barriers that women face, MCs can contribute to more equitable participation in traditionally male-dominated sectors, such as construction.

Ultimately, for MCs to be successful, they must be trusted by employers, recognized across sectors, and designed to meet the evolving needs of industries. With the proper balance of regulation, flexibility, and quality assurance, MCs can become a powerful tool in enhancing skills development in Germany, helping to address labour shortages, support career mobility, and ensure the workforce is prepared for future challenges.

Regarding the European-wide skills-shortage in the construction sector, it might be worthwhile to consider all existing courses in construction, which are not part of BBIG or the Dual System in Germany, as potential MCs on a European level.

8. Micro-credentials in Greece

In this section, the state of MCs in Greece is described, based on the research carried out and the experience of Greek partners, ACP – Active Citizens Partnership, PEDMEDE - The Panhellenic Association of Engineers Contractors of Public Works, and DUTH - Democritus University of Thrace.

8.1. Introduction

MCs in Greece are gaining traction as tools for flexible, targeted, and lifelong learning. These credentials meet the needs of the labour market by providing specific skill sets and competencies in a more flexible and modular format compared to traditional qualifications. This approach addresses the demand for continuous education and skills development in a rapidly evolving job market.

Greek higher education institutions are incorporating MCs to address the needs for upskilling and reskilling in response to rapidly changing job market demands. Key regulatory frameworks and initiatives include:

- Law 4485/2017: Establishes the framework for higher education and includes provisions for modular learning and lifelong education programs. This law provides a basis for universities and polytechnics to offer MCs as part of their educational portfolio.
- Digital Transformation of Education: Initiatives to digitise and modernise educational content and delivery, supporting the development and recognition of MCs. This transformation includes the adoption of online platforms and digital tools to facilitate learning.

MCs in higher education typically align with the ECTS, ensuring their recognition and portability across the EU. Universities and polytechnics are increasingly offering short, targeted courses that lead to MCs, which can be stacked to form larger qualifications.

8.2. Skills and qualifications frameworks

Vocational training in Greece is regulated by the National Organisation for the Certification of Qualifications and Vocational Guidance (EOPPEP). This body oversees the certification of vocational training programs, including those that could be structured as MCs. The vocational training landscape includes:

- Dual VET: Combines classroom instruction with on-the-job training, providing a framework conducive to the integration of MCs. This model helps ensure that training is directly relevant to the needs of employers and the labour market.
- Lifelong Learning Centres (LLCs): Offer a variety of short courses and training programs that can be recognized as MCs. These centres cater to both employed individuals seeking to enhance their skills and unemployed individuals looking to improve their employability.

Several institutions and organisations in Greece have begun implementing MCs:

- Higher Education Institutions: Universities are developing MC programs usually through their established Lifelong Learning Centres (KEDIBIM), particularly in digital skills, business, and engineering. These programs often involve collaboration with industry partners to ensure relevance and applicability.
- Vocational Training Providers: Institutions like the Manpower Employment Organisation (DYPA former OAED) and various private training centres offer short-term courses that could be adapted into MCs. These courses cover a wide range of fields, including information technology, healthcare, and construction.

MCs in Greece are being tailored to specific sectors to address particular skill gaps:

- Digital Skills: Programs focusing on coding, data analysis, cybersecurity, and other digital competencies are being developed to meet the increasing demand for tech-savvy professionals. These skills are critical in a variety of industries, from finance to healthcare.
- Green Skills: In response to environmental challenges, MCs in sustainable practices, renewable energy, and environmental management are emerging. These programs support Greece's commitment to environmental sustainability and the green economy.

- Healthcare: MCs for healthcare workers are being introduced to update skills in areas like patient care, medical technology, and health informatics. These credentials help ensure that healthcare professionals are equipped to handle the latest advancements and practices.

8.2.1. Needs to be addressed for the development of MCs for Construction Sector in Greece

Greece, with its rich architectural heritage and frequent seismic activity, faces unique challenges in maintaining and upgrading its existing building stock. The construction sector in Greece has yet to establish MCs specifically aimed at green skills for the rehabilitation and strengthening of existing structures. Developing such MCs is crucial, as these techniques require specific knowledge and expertise. If not applied properly, the effectiveness of these methods can be significantly compromised, potentially leading to structural failures and missed opportunities for sustainable development.

- Why Focus on Rehabilitation and Strengthening?
  - Environmental Sustainability

Preservation Over Demolition: By rehabilitating and strengthening existing buildings, we reduce the need for new construction materials. This conserves natural resources and lowers the environmental impact associated with material extraction, production, and transportation.

Efficient Use of Existing Structures: Techniques such as externally bonded Fiber Reinforced Polymers (FRPs), near surface mounted reinforcement, and shotcrete make optimal use of existing building materials, reducing the need for new resources and minimising environmental footprints.

  - Minimising Waste

Waste Reduction: Demolishing buildings generates substantial construction and demolition waste, which often ends up in landfills. Rehabilitation and retrofitting significantly cut down on this waste, promoting a circular economy where materials are reused and recycled.

  - Efficient Material Usage: These techniques ensure precise application, reducing material waste during the strengthening process.
  - Energy Efficiency

Lower Embodied Energy: Existing buildings have already expended significant energy in their initial construction. By focusing on retrofitting rather than rebuilding, we save the additional embodied energy that new construction would require.

  - Structural and Cultural Benefits

Enhancing Safety: Given Greece's seismic activity, strengthening buildings to withstand earthquakes is crucial. This not only ensures the safety of residents but also preserves the structural integrity of existing buildings.

Cultural Preservation: Many of Greece's buildings are historically significant. Rehabilitation allows these cultural landmarks to be preserved while upgrading them to meet modern safety and efficiency standards.

- Why are MCs in this direction considered Green Skills?
  - Targeted Training for Sustainability:

Specialised Knowledge: MCs focused on green skills for rehabilitation and strengthening provide workers with the necessary expertise to apply sustainable construction practices. This includes knowledge of eco-friendly materials, energy-efficient techniques, and waste reduction strategies.

Practical Application: Workers trained through these MCs can effectively implement techniques such as using FRPs for reinforcement, installing near surface mounted reinforcements, and applying shotcrete. Proper application ensures these methods are both effective and sustainable.

o   Ensuring Effectiveness and Safety:

Preventing Ineffectiveness: These techniques require precise application and specific knowledge. Improper application can lead to structural ineffectiveness or failures. MCs ensure workers are well-trained to avoid these risks.

Adherence to Standards: Proper training ensures compliance with local and EU regulations, promoting safety and sustainability in construction practices.

o   Economic and Social Benefits:

Cost-Effective Solutions: Rehabilitation and retrofitting are often more cost-effective than new construction, especially when considering the environmental and social costs. This approach supports economic sustainability while addressing the need for safe and efficient buildings.

Workforce Development: Developing MCs enhances the skill set of the workforce, making them more versatile and employable in a green economy. This benefits individual workers and strengthens the construction industry.

8.3. Credit systems

Greece participates in international initiatives and collaborations for the development and recognition of MCs. Some of the key points include:

- European Qualifications Framework (EQF): Participation in the EQF facilitates the integration of MCs into the EQF, making it easier to recognize and transfer qualifications across European countries.
- OECD Skills Initiative: Collaboration with the OECD to promote MCs and recognize the skills acquired through them.

8.4. Digital credentials and quality assurance tools, with attention to gender aspects

Based on the data provided in Tables 5 and 9 the state of MCs related to the construction sector in Greece appears to be evolving even though there is still not a clear baseline and most of the provided courses do not appear to have the exact meaning of "MCs". Some key observations include:

- Variety and Specialization:

The courses cover specialised topics like construction management, on-site safety, 3D modelling, and renewable energy technologies. This specialisation suggests that MCs are tailored to specific industry needs, offering targeted skill enhancement.

- Flexible Learning Formats:

The availability of online, onsite, blended, and e-learning formats indicates a flexibility that caters to different learning preferences and schedules. This flexibility is crucial for professionals who need to balance ongoing education with work commitments.

- Practical Focus:

A significant emphasis on hands-on and practical training reflects the demand for skills that can be directly applied in the workplace. This is particularly important in fields that require practical knowledge and expertise.

- Affordability and Accessibility:

The range of tuition fees, including courses funded by initiatives like LAEK, suggests efforts to make education more accessible. Financial support mechanisms are essential to encourage participation in lifelong learning and professional development.

- Certification and Credibility:

Some courses offer certifications and credits (*e.g.*, ECVET), which adds value by providing recognised credentials that can enhance career prospects. However, detailed information on the quality assurance mechanisms behind these MCs is limited, which is an area that could be further developed to ensure credibility and trust.

- Targeted Audience:

The courses are designed for a specific audience, including architects, engineers, and construction managers. This targeted approach ensures that the MCs are relevant and valuable to the intended professionals.

- Learning Materials and Platforms:

The use of diverse learning materials and platforms, including videos, apps, and e-learning platforms, indicates an embrace of modern educational technologies. This enhances the learning experience and makes it more engaging and effective.

- Addressing the Gender Gap in Green Skills Training in Greece's Construction Sector

In recent years, the construction sector has been undergoing a significant transformation, embracing green technologies and sustainable practices. However, in Greece, the training offer for green skills is not adequately targeting women, leading to their underrepresentation in this vital industry. Understanding the current employment landscape and the barriers faced by women can help develop strategies to bridge this gap.

- Current Employment Statistics for Women in Construction in Greece

As of the latest data, women constitute only a small fraction of the workforce in the construction sector in Greece. According to the Hellenic Statistical Authority, women make up less than 10% of the total construction workforce. This is significantly lower compared to the overall employment rate of

women in Greece, which stands at around 45%[57]. This disparity highlights a critical area of concern that needs to be addressed through targeted interventions.

- Specialised Training Offer for Green Skills

Greece has made strides in offering training programs aimed at equipping the workforce with green skills essential for the construction industry's future. These programs include courses on sustainable building practices, energy efficiency, and renewable energy technologies. However, these training opportunities are not effectively reaching women. A study by the European Institute for Gender Equality (EIGE) found that less than 15% of participants in green skills training programs in Greece were women.[58] This indicates a significant gap in the inclusivity of these programs.

8.4.1. Main Causes for Low Female Participation in Construction

Several factors contribute to the low participation of women in the Greek construction sector as in other European countries:

- Social and Cultural Factors: Traditional gender roles and stereotypes discourage women from pursuing careers in construction. The perception that construction is a "male-dominated" field persists, limiting women's interest and entry into the industry.[59]
- Educational and Training Barriers: There is a lack of awareness and outreach about training opportunities targeted at women. Additionally, educational pathways leading to careers in construction are often not promoted to female students.
- Workplace Environment and Discrimination: Women in construction may face a hostile work environment, gender discrimination, and a lack of mentorship and support. These factors contribute to high attrition rates and discourage women from entering or staying in the sector.[60]
- Lack of Targeted Recruitment and Retention Efforts: There is insufficient effort to recruit and retain women in construction. Companies and training providers often do not have gender-specific strategies to attract and support female workers.

Addressing these challenges according to the European Construction Industry Federation (2023), requires a multifaceted approach:[61]

- Promoting Awareness and Education: Campaigns and initiatives should be launched to promote the construction sector and green skills training programs to women. Schools and vocational training centres should encourage female students to consider careers in construction.

---

[57] Hellenic Statistical Authority (2024). https://www.statistics.gr/documents/20181/fb2c0a96-a301-5f45-8731-39aa235a4afc. Access June 2024.

[58] Gender Equality Index (2023). https://eige.europa.eu/publications-resources/publications/gender-equality-index-2023-towards-green-transition-transport-and-energy. Access June 2024.

[59] Magnusdottir, G.L., & Kronsell, A. (Eds.). (2021). Gender, Intersectionality and Climate Institutions in Industrialised States (1st ed.). Routledge. https://doi.org/10.4324/9781003052821.

[60] Clarke, Linda & Sahin-Dikmen, Melahat. (2021). Why radical transformation is necessary for gender equality and a zero carbon European construction sector. 10.4324/9781003052821-12.

[61]FIEC – European Construction Industry Federation (2023). https://fiec-manifesto.eu/ensure-fair-working-conditions.html. Access June 2024.

- Creating Inclusive Training Programs: Training providers should design and market their programs to be more inclusive. This includes offering flexible schedules, providing childcare support, and creating a welcoming environment for women.
- Improving Workplace Conditions: Companies in the construction sector should implement policies to create a more inclusive and supportive workplace. This includes addressing discrimination, providing mentorship programs, and ensuring equal opportunities for advancement.
- Policy and Government Support: The government should introduce policies and incentives to encourage the participation of women in the construction sector. This could include funding for women-specific training programs and support for companies that actively promote gender diversity.[62]

8.5. Highlights

Greece urgently needs to develop MCs in green skills for the rehabilitation and strengthening of existing buildings. Focusing on the application of specific techniques that are the most effective and known (such as externally bonded FRPs, near surface mounted reinforcement, and shotcrete) to ensure that these methods are applied effectively and sustainably. Properly trained workers can significantly contribute to environmental sustainability, structural safety, and the preservation of Greece's rich architectural heritage. Establishing these MCs will not only support Greece's construction sector in meeting modern challenges but also align with global sustainability goals. Furthermore, by addressing issues of gender inclusivity on the training and employment offer, Greece can create a more diverse construction sector, better equipped to meet the demands of a sustainable future. Encouraging more women to acquire green skills will not only benefit the industry but also contribute to gender equality and economic growth.

9. Research into Existing Provision

Following the systematic review about MC in Europe, all partners have researched into systematic review of literature and policy documents to identify existing provisions of short courses and MCs in the construction sector, with a focus on Greece, Germany, Portugal and Spain.

A total of 53 documents (Table 5) and 158 courses (Tables 6-10) were analysed. The researchers considered the green skills of the construction sector provided by ESCO Classification[63] in searching for courses. Moreover, the criteria used for courses research were:

- Courses with MC certification.
- Courses delivered for the construction sector, such as construction sector employees, construction sector employers, teachers and trainers, researchers, policy makers and planners, educational managers and general public.

The MCs courses were analysed, and the mandatory and optional elements provided above in the first section of this document (*i.e.*, identified by the EU in 2022) were considered. Table 4 shows the topics

---

[62] National Action Plan for Gender Equality (2021). https://isotita.gr/wp-content/uploads/2023/04/National-Action-Plan-for-Gender-Equality-2021-2025.pdf. Access June 2024.

[63] ESCO (2020) https://esco.ec.europa.eu/en/classification.

of the courses, and the prevalence applied. The three topics related to green skills appearing most often in the course's titles are: "Sustainability", "Digital technologies" and "Green building".

Table 4. Prevalence of the course's topic.

Topics	Prevalence (%)
Others*	27
Digital technologies	25
Sustainability	12
Green building	12
Efficiency	9
Decarbonization	4
Circular economy	4
Resilient structures	3
Seismic systems	2
Smart city	2
TOTAL	100 %

*Courses not related to green skills.

The analysis shows that most of the courses found by the researchers (42%) are offered online, while 18% of them are on-site and 14% blended (Figure 6A). Most of the tuition fees for these courses are unknown (28%) while 15% of the courses have tuition fees over 1000 € (Figure 6B). Another issue to consider is that 66% of the courses found by the researchers do not clearly inform about the workload required (Figure 6C). About 61% of the training institutions are universities, while 16% are private organisations (excluding universities) (Figure 6D). In terms of course format, 30% of the courses are theoretical/hands-on, 25% are purely theoretical and 11% are purely hands-on.

After analysis of the courses found by the researchers, the following results have been drawn:

- The most common topics of the MC courses in the construction sector are "digital technologies", "sustainability" and "green building", confirming that Green Circle is addressing an area of high demand**.**
- Most of the courses we found via desk research are offered online, which from the courses found suggests that this is the preferred option for learners, should be confirmed by the questionnaire to the stakeholder following, just to clarify the choice**.**
- Only 33% of the courses found give details about the ECTS because de info does not exist on the course web page.
- Most of the awarding bodies of the courses found are universities.

Nevertheless, it is quite important to notice that most institutions do not provide complete information regarding MC courses. As it can be observed in Figure 6, there is some unknown data. It is essential to keep these statistics in mind while designing MC courses to ensure that they meet the desired standards.
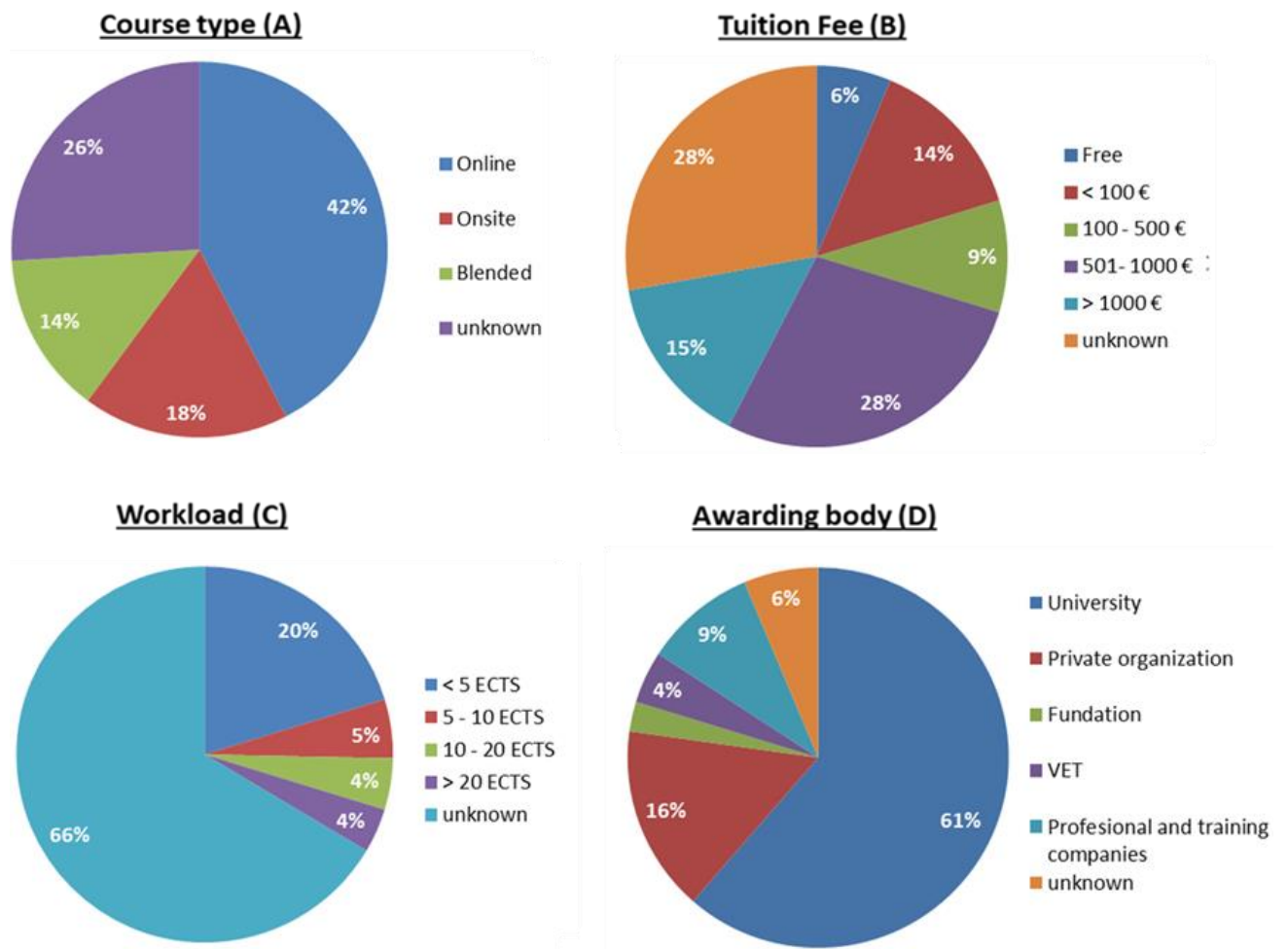
Figure 6. Description of the analysed courses.

Table 5. *Liste of relevant literature per country.*

Title of the document	Type of document	Link
PORTUGAL		
Microcredentials: an opportunity towards the digital transformation	Research Article	http://dx.doi.org/10.4995/HEAd23.2023.16125
Impulso Jovem STEAM e Impulso Adutos - Recuperar Portugal construindo o futuro	Policy Document	https://recuperarportugal.gov.pt/wp-content/uploads/2022/01/brochura_final_19.1.22.pdf
Microcredentials courses from Portuguese Open University	Other	https://portal.uab.pt/alv/en/
Microcredentials courses from Instituto Universitário Atlantica	Other	https://www.uatlantica.pt/microcredenciais/
Microcredentials courses from Blue Design Alliance	Other	https://esad.pt/pt/news/cursos-de-curta-duracao-financiados-microcredenciais
Micredentials courses from University of Aveiro	Other	https://www.ua.pt/en/cursos/tipo/microcredenciais
Microcredentials	PowerPoint presentation	https://repositorioaberto.uab.pt/bitstream/10400.2/12606/1/FCaetano%20Erasmus%2b%20Staff%20Week%202022%20Jun29.pdf
Spain		
Article 11 – Online Portal of Higher Vocational Training Schools – Addition of Article 33B to Law 4763/2020	Policy Document	http://www.opengov.gr/ypepth/?p=6139
BOE-A-2021-15781	Policy Document	https://www.boe.es/boe/dias/2021/09/29/pdfs/BOE-A-2021-15781.pdf

Framework document for quality assurance of microcredentials (ANECA)	Guidelines	https://www.aneca.es/documents/20123/49576/MICROCREDENCIALES_Informe_V3.pdf/
Action Plan for the development of University micro-credentials in Spain.	Guidelines	https://www.universidades.gob.es/wp-content/uploads/2023/10/DOC-planmicrocreds_SIN-MARCAS.pdf
The offer of microcredentials promotes inclusion and equal opportunities	Other	https://www.crue.org/2023/06/
Germany		
Micro-Credentials at Higher Education Institutions – Strategy Development and Quality Assurance - Results of the Expert Group on Micro-Credentials	Research Article	https://www.hrk-modus.de/media/redaktion/Downloads/Publikationen/MODUS/English/EN_Micro-Credentials_at_HEIs_web.pdf
Case study Germany - Microcredentials for labour market education and training	Report	https://www.cedefop.europa.eu/files/germany_microcredentials_mapping.pdf
Greece		
The impact of the introduction of micro-credentials in the Greek lifelong learning system	Research Article	https://eposters.betterevents.io/diabiou2023/web/sessions/oi-epiptoseis-tis-eisagogis-ton-mikrodiapisteytirion-sto-systima-dia-bioy-mathisis-tis
Micro-credentials as an alternative way of obtaining qualifications – Trends and Challenges for Greek higher education	Thesis	https://www.ethaae.gr/images/articles/meletes/NEW_Meletes/Μικροδιαπιστευτήρια_2022.pdf
Skills policies and micro-credentials	Thesis	https://elocus.lib.uoc.gr/hierarchy/collection/020/030/020/

EU		
Are microcredentials becoming a big deal?	Research Article	https://www.cedefop.europa.eu/en/publications/9171
Microcredentials for labour market education and training: the added value for end users	Research Article	https://www.cedefop.europa.eu/en/publications/5587
Microcredentials for labour market education and training: the added value for end users	Research Article	https://www.cedefop.europa.eu/en/publications/5589
Microcredentials for labour market education and training: the added value for end users	Research Article	https://www.cedefop.europa.eu/en/publications/5603
Exploring the emergence of microcredentials in vocational education and training (VET)	Research Article	https://www.cedefop.europa.eu/en/publications/6221
Microcredentials: striving to combine credibility and agility	Report	https://op.europa.eu/en/publication-detail/-/publication/e706c615-be61-11ee-b164-01aa75ed71a1/language-en
European Education Area	Report	https://education.ec.europa.eu/education-levels/higher-education/micro-credentials
European project MICROBOL - Micro-credentials linked to the Bologna Key Commitments	Report	https://microcredentials.eu/wp-content/uploads/sites/20/2022/03/Micro-credentials_Framework_final-1.pdf
Towards a European approach to micro credentials: a study of practices and commonalities in offering micro-credentials in European higher education	Report	https://nesetweb.eu/wp-content/uploads/2020/12/NESET_AR2-2020_Full-Report.pdf

Microcredentials for labour market education and training. First look at mapping microcredentials in European labour-market-related education, training and learning: take-up, characteristics and functions	Report	https://op.europa.eu/en/publication-detail/-/publication/67840338-657f-11ed-9f85-01aa75ed71a1/language-en
QUALITY ASSURANCE OF MICRO-CREDENTIALS: Expectations within the Context of the Standards and Guidelines for Quality Assurance in the European Higher Education Area	Report	https://www.enqa.eu/publications/qa-of-micro-credentials/
Microcredentials for labour market education and training Microcredentials and evolving qualifications systems	Report	https://www.cedefop.europa.eu/files/5589_en.pdf
Proposal for a Council Recommendation on a European approach to microcredentials for lifelong learning and employability	Recommendation proposal	https://data.consilium.europa.eu/doc/document/ST-9237-2022-INIT/es/pdf
A European Approach to Micro-credentials	Guidelines	https://education.ec.europa.eu/sites/default/files/2022-01/micro-credentials%20brochure%20updated.pdf
Others Countries		
An analysis of 'micro-credentials' in VET	Research Article	https://apo.org.au/node/312609
Extending micro-credentials to micro-apprenticeships for the Fourth Industrial Revolution: Enhancing vocational education and training in the post-pandemic's 'new normal'	Research Article	https://search.informit.org/doi/abs/10.3316/informit.961740829652784
Survey of micro- credentialing practice in Australasian universities	Research Article	https://publications.ascilite.org/index.php/APUB/article/view/695

A maturity model for micro-credentialing and shorter forms of learning practice in Australasian universities	Research Article	https://www.tandfonline.com/doi/full/10.1080/1360080X.2023.2299150
Digital micro-credentials in environmental science: an employer perspective on valued evidence of skills	Research Article	https://www.researchgate.net/publication/359452914
Microcredentials and work-integrated learning	Research Article	https://www.ijwil.org/files/IJWIL_22_3_423_432.pdf
Design and Implementation of an Industry 4.0 Micro-Credential Program	Research Article	https://ojs.library.queensu.ca/index.php/PCEEA/article/view/17111
Green Engineering Education in Environmental Engineering Programme through Active Learning	Research Article	https://pdfs.semanticscholar.org/278d/845bff760180bee0291bca4e3d26e51a5092.pdf
An assessment of micro-credentials in New Zealand vocational education	Research Article	https://www.tandfonline.com/doi/full/10.1080/14480220.2021.2018018
Greening of Training Programs for Construction Specialists for Sustainable Development	Research Article	https://www.scitepress.org/Link.aspx?doi=10.5220/0010595806780684
Drivers of the global push for microcredentials in higher education: flexibility and employability in contemporary university systems	Research Article	https://www.tandfonline.com/doi/full/10.1080/13603108.2023.2229767
Micro-credentials for Impact: Holding Professional Learning to High Standards	Research Article	https://learningforward.org/wp-content/uploads/2017/08/micro-credentials-for-impact.pdf
Innovative and Emerging Intersections Between Industry and Academia: Rationale for Micro-credentialing	Research Article	https://www.emerald.com/insight/content/doi/10.1108/978-1-80382-459-820231005/full/html

Development and Validation of a Questionnaire for Microlearning Requirements in Micro-Credentials: A Pilot Study	Research Article	https://www.researchsquare.com/article/rs-3162218/v1
Micro-credentialing: A Path to More Resilient Communities	Research Article	https://www.emerald.com/insight/content/doi/10.1108/978-1-80382-459-820231008/full/html
The development of a novel educational model to successfully upskill technical workers for Industry 5.0: Ireland a case study	Research Article	https://www.sciencedirect.com/science/article/pii/S2405896322031147
A new higher education curriculum model to meet the needs of the Civil Construction industry	Research Article	https://18aaee.s3.amazonaws.com/proceedings/AAEE18_Rose_103.pdf
Micro-credentials in Professional Higher Education	Report	https://www.eurashe.eu/wp-content/uploads/2022/02/micro-credentials-in-professional-higher-education.pdf
Case study Slovenia - Microcredentials for labour market education and training	Report	https://www.cedefop.europa.eu/files/slovenia_microcredentials_mapping.pdf
Microcredentials Designing innovative pathways to and beyond degree offerings	Report	https://www.pechakucha.com/presentations/microcredentials-designing-innovative-pathways-to-and-beyond-degree-offerings
Challenges and Opportunities of Micro-Credentials in Europe	Report	https://microcredentials.eu/wp-content/uploads/sites/20/2019/12/
The Case for Microcredentials for Workforce Preparation	Report	https://www.ingentaconnect.com/content/mts/mtsj/2022/00000056/00000001/art00008;jsessionid=xpki0392rqny.x-ic-live-03#
Making micro-credentials work for learners, employers and providers	Report	https://www.nki-latvija.lv/content/files/Making-micro-credentials-work-Oliver-Deakin-2019.pdf

How can you use microlearning for construction safety training?	Publication in social media	https://www.linkedin.com/advice/1/how-can-you-use-microlearning-construction-pw5nf
Basic Construction Skills Micro-credential	Learning resources	https://bconstructive.co.nz/small-business-and-micro-credential-resources/basic-construction-skills-micro-credential
Tiny Lessons Big Impact - The rise of microlearning in construction	Microlearning series	https://www.matcgroup.com/business/tiny-lessons-big-impact-the-rise-of-microlearning-in-construction/
Micro-credentials and European Digital Credentials for Learning	Other	https://year-of-skills.europa.eu/events-and-activities/
A Step-by-Step Guide for Developing a Microcredentialing Program	Book Chapter	https://www.igi-global.com/chapter/a-step-by-step-guide-for-developing-a-microcredentialing-program/314851

Table 6. Liste of courses in Portugal.

Portugal					
Course Name	**Type**	**Course duration**	**Tuition Fee (€)**	**Awarding body**	**Link**
Microcredencial in Circular economy in construction	B-learning	72h	120	Universidade de Aveiro	https://www.ua.pt/en/course/1663
Micro-credential in Smart Digital Construction	B-learning	81h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16515
Micro-credential in High Energy-efficiency Buildings	B-learning	81h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16510
Micro-credential in Water Efficient Buildings	B-learning	24h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16511
Micro-credential in Designing geothermal systems for more sustainable buildings	B-learning	81h	120 (national students-NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1668
Micro-credential in Inspection and diagnosis of existing buildings and infrastructures	B-learning	30h	120 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1670
Microcredit in Resilient Structures	B-learning	27h	40 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1671
Micro-credit in Digital Technologies to Support Design, Implementation and Operation	B-learning	24h	120 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1666
Seismic action and anti-seismic design of steel and timber structures	B-learning	60h	80 (NS)	Universidade de Aveiro	https://www.redepolitecnica.pt/info_micro.php?cod_curso=66
Sustainability management	B-learning	21h	82	Instituto Politécnico de Tomar	https://www.redepolitecnica.pt/info_micro.php?cod_curso=36
Circular economy in construction	B-learning	56h	120	Escola Superior de Engenharia - Instituto Politécnico de Coimbra	https://www.ua.pt/en/course/1663

Energy Generation and Storage	B-learning	56h	120	Instituto Superior de Engenharia - Universidade do Algarve	https://www.redepolitecnica.pt/
Sustainability management	B-learning	21h	82	IPCA	https://www.redepolitecnica.pt/info_micro.php?cod_curso=36
Circular economy in construction	B-learning	56h	120	Universidade de Aveiro	https://www.ua.pt/en/course/1663
Energy Generation and Storage	B-learning	56h	120	A23 – Rede Polotécnica	https://www.redepolitecnica.pt/
Microcredencial in Circular economy in construction	B-learning	72h	120	Universidade de Aveiro	https://www.ua.pt/en/course/1663
Micro-credential in Smart Digital Construction	B-learning	81h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16515
Micro-credential in High Energy-efficiency Buildings	B-learning	81h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16510
Micro-credential in Water Efficient Buildings	B-learning	24h	120	Universidade de Aveiro	https://www.ua.pt/en/uc/16511
Micro-credential in Designing geothermal systems for more sustainable buildings	B-learning	81h	120 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1668
Micro-credential in Inspection and diagnosis of existing buildings and infrastructures	B-learning	30h	120 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1670
Microcredit in Resilient Structures	B-learning	27h	40 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1671
Micro-credit in Digital Technologies to Support Design, Implementation and Operation	B-learning	24h	120 (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1666
Seismic action and anti-seismic design of steel and timber structures	B-learning	60h	80 (NS)	Instituto Politécnico de Tomar	https://www.redepolitecnica.pt/info_micro.php?cod_curso=66
Big data	E-learning	100h	340	Universidade de Aveiro	https://www.ipbeja.pt/cursos/Microcredenciais/Documents/DESCRITOR_Big_Data.pdf

Renewable energies - solar thermal	Multiple	325h	free	Instituto Superior de Engenharia - Universidade do Algarve	https://catalogo.anqep.gov.pt/percursosDetalhe/66
Renewable energies - solar photovoltaic	Multiple	350h	free	Instituto Superior de Engenharia - Universidade do Algarve	https://catalogo.anqep.gov.pt/percursosDetalhe/67
Renewable energies - wind	Multiple	350h	free	NA	Catálogo Nacional de Qualificações (anqep.gov.pt)
Green hydrogen - fundamentals and technologies	Multiple	300h	free	NA	Catálogo Nacional de Qualificações (anqep.gov.pt)
Introdução à Programação	Multiple	50h	free	Portal da Construção Sustentável (PCS)	https://ipca.pt/cursos-breves-prr/cursos-breves-prr-2/
Micro-credential in Fire Resistant Buildings	NA	36h	80	Escola Superior de Tecnologia de Castelo Branco (IPCB)	https://www.ua.pt/en/uc/16512
Bim project initiation	NA	20h	90	IPCA	https://www.estbarreiro.ips.pt/cursos/cursos-breves/projeto-bim
Seismic Assessment and Rehabilitation of Buildings	NA	44h	90	Universidade de Aveiro	https://portal2.ipt.pt/pt/cursos/microcredenciacao/Mc_-_ARSE/
Specialist in Energy Rehabilitation and Infrastructure Conservation - Buildings	NA	850h	free	Portal da Construção Sustentável (PCS)	https://catalogo.anqep.gov.pt/qualificacoesDetalhe/922
Sustainable construction	NA	12h	120	Ordem dos Engenheiros	https://www.cflv.pt/pt/ensino_/ofertaformativa_/formacao_/curso_47304
Specialist in Energy Rehabilitation and Infrastructure Conservation - Buildings	NA	850h	free	NA	https://catalogo.anqep.gov.pt/qualificacoesDetalhe/922
Micro-credential in Fire Resistant Buildings	NA	36h	80	Universidade Aberta	www.uab.pt
Introduction to local implementation of the sustainable development goals (sdgs)	Online	26h	free	Universidade Aberta	https://portal.uab.pt/alv/cursos_alv/introducao-aos-ods-local/
Digital transition and improving organisational efficiency	Online	26h	free	Universidade Aberta	https://portal.uab.pt/alv/cursos_alv/

Course	Format	Duration	Price	Institution	Link
Course on Structural Eurocodes Module II - New Structures - Seismic Design Situations	Online	15h	175	Escola Superior Agrária - Instituto Politécnico de Beja	https://www.ualg.pt/curso/2923
Course on Structural Eurocodes - Module III Assessment and Reinforcement of Reinforced Concrete Structures	Online	18h	200	Escola Superior do Barreiro - Instituto Politécnico de Setúbal	https://www.ualg.pt/curso/2924
BIM and the Digitalization of Construction Safety	Online	8h	100	NA	https://ibagaia.pt/courses/bim-digitalizacao-seguranca-construcao/
Microcredential in Digital Technologies to Support Project, Execution and Operation	Online	4 weeks	120	NA	https://www.ua.pt/pt/curso/1666
Introduction to Sustainable Construction	Online	16h	30 or 50 or 200	Universidade de Aveiro	https://haengenhariaemagenda.oern.pt/cursos/construcao-sustentavel-iniciacao/
Project management professional (pmp)	Online	35h	1150	Polytechnic Institute of Management and Technology	https://smarterexecution.pt/programa-de-formacao-pmp/
Gestão de Projetos	Online	50h	free	EIC - Formação	https://ipca.pt/cursos-breves-prr/cursos-breves-prr-2/
Robótica para não especialistas	Online	50h	free	Portal da Construção Sustentável (PCS)	https://ipca.pt/cursos-breves-prr/cursos-breves-prr-2/
BIM and the Digitalization of Construction Safety	Online	8h	100	IPCA	https://ibagaia.pt/courses/bim-digitalizacao-seguranca-construcao/
Microcredential in Digital Technologies to Support Project, Execution and Operation	Online	4 weeks	120	IPCA	https://www.ua.pt/pt/curso/1666
Seismic action and anti-seismic design of steel and wooden structures	Online	60h	80 (120 International Student-IS)	IPCA	https://www.redepolitecnica.pt/info_micro.php?cod_curso=66
Circular economy	Online	50h	500	ISLA Business Academy	https://ibagaia.pt/courses/economia-circular/

Course	Mode	Hours	Price	Institution	Link
Training in architecture, energy and climate	Online	15h	200	Polytechnic Institute of Management and Technology	https://csustentavel.com/oniline-formacao-em-arquitetura-energia-e-clima/
Introdução à Inteligência Artificial	Online	50h	free	IPCA	https://ipca.pt/cursos-breves-prr/cursos-breves-prr-2/
Introduction to local implementation of the sustainable development goals (sdgs)	Online	26h	free	Universidade Aberta	https://portal.uab.pt/alv/cursos_alv/introducao-aos-ods-local/
Digital transition and improving organisational efficiency	Online	26h	free	Universidade de Aveiro	https://portal.uab.pt/alv/cursos_alv/
Course on Structural Eurocodes Module II - New Structures - Seismic Design Situations	Online	15h	175	Instituto Superior de Engenharia - Universidade do Algarve	https://www.ualg.pt/curso/2923
Course on Structural Eurocodes - Module III Assessment and Reinforcement of Reinforced Concrete Structures	Online	18h	200	Instituto Superior de Engenharia - Universidade do Algarve	https://www.ualg.pt/curso/2924
Building and Occupational Safety	Onsite	75h	NA	Universidade de Aveiro	https://www.ipbeja.pt/cursos/Microcredenciais/Documents/
Microcreditials programme in home automation systems and intelligent buildings	Onsite	40h	NA	Escola Superior Agrária - Instituto Politécnico de Beja	https://www.ipc.pt/oferta-formativa/
Course in Geotechnical Works	Onsite	53h	185	Escola Superior de Tecnologia - Instituto Politécnico de Castelo Branco	https://www.ualg.pt/curso/2987
Training in sustainable buildings	Onsite	NA	255	ISLA Business Academy	https://csustentavel.com/formacao-em-edificios-sustentaveis/
Sustainable constructions	Onsite	40 h	NA	Escola Superior de Tecnologia de Castelo Branco (IPCB)	https://eicformacao.pt/cursos/construcao-civil-construcao-sustentavel/
Microcredencial in the twists and turns of water in a canal	NA	86h	120€ (NS)	Universidade de Aveiro	https://www.ua.pt/pt/uc/16507
Microcredit in Coastal Protection	NA	15h	40€ (NS)	Universidade de Aveiro	https://www.ua.pt/pt/curso/1664

Table 7. *List of courses in Spain.*

Spain					
Course Name	Type	Course duration	Tuition Fee (€)	Awarding body	Link
University Microcredential in Technician in Basic Tools for Environmental Remote Sensing with Open Data	B-learning	8 month	300	Universitat Politecnica de Catalunya	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-web-Teledeteccion-basico.pdf
University Microcredential in Data Analysis for Natural Resources Management – GEODATA	B-learning	8 month	300	Pablo Olavide University	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-Web-GEODATA.pdf
Urban retrofit and Financial Aid management	B-learning	40 h	NA	Official Architectural Association of Navarra and Biskaia	http://www.cscae.com/index.php/arquitectos/faqs-ayudas-a-la-rehabilitacion-por-temas/rehabilitacion
Circular economy in builidngs	B-learning	12 h	198	Universidad San Jorge/ Official Architectural Association of Aragón	https://www.escolasert.com/es/oferta-formativa/curso-taller-economia-circular-en-edificios
Decarbonization, circular economy & hidrogen	B-learning	60 h	NA	BIskaia Architectural Association	https://web.unican.es/departamentos/ingquimica/estudios/detalle-estudios-propios?e=645
Composting course	B-learning	50 h	250	Escola Sert	https://fuam.es/curso-corto/microcredencial-curso-de-maestria-en-compostaje-1a-edicion/
Specialist on Carbon Footprint and Energy Efficiency in organizations	B-learning	52,5 h	920	University of Cantabria	https://www.upo.es/formacionpermanente/microcredenciales/especialista-en-huella-de-carbono-y-eficiencia-energetica/
Microcredencial Universitaria en Técnico en Herramientas Avanzadas para la Teledetección Ambiental con Datos Abiertos | 2024/25	B-learning	14,9 ECTS	300	Universidad de Cantabria	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-web-Teledeteccion-Avanzado.pdf
MICROCREDENCIAL: Curso de maestría en compostaje (1ª Edición)	B-learning	5 ECTS	250	Universidad de Valladolid	https://fuam.es/curso-corto/microcredencial-curso-de-maestria-en-compostaje-1a-edicion/
Especialista en Huella de Carbono y Eficiencia Energética	B-learning	7 ECTS	920	Fundación Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/especialista-en-huella-de-carbono-y-eficiencia-energetica/

Microcredencial Universitaria en Técnico en Herramientas Avanzadas para la Teledetección Ambiental con Datos Abiertos | 2024/25	B-learning	14,9 ECTS	300	Universidad de Cantabria	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-web-Teledeteccion-Avanzado.pdf
MICROCREDENCIAL: Curso de maestría en compostaje (1ª Edición)	B-learning	5 ECTS	250	Universidad de Valladolid	https://fuam.es/curso-corto/microcredencial-curso-de-maestria-en-compostaje-1a-edicion/
Especialista en Huella de Carbono y Eficiencia Energética	B-learning	7 ECTS	920	Fundación Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/especialista-en-huella-de-carbono-y-eficiencia-energetica/
University Microcredential in Technician in Basic Tools for Environmental Remote Sensing with Open Data	B-learning	8 month	300	Pablo Olavide University	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-web-Teledeteccion-basico.pdf
University Microcredential in Data Analysis for Natural Resources Management – GEODATA	B-learning	8 month	300	Valladolid University	https://funge.uva.es/wp-content/uploads/2023/08/Plantilla-Web-GEODATA.pdf
Urban retrofit and Financial Aid management	B-learning	40 h	NA	BIskaia Architectural Association	http://www.cscae.com/index.php/arquitectos/faqs-ayudas-a-la-rehabilitacion-por-temas/rehabilitacion
Circular economy in builidngs	B-learning	12 h	198	BIskaia Architectural Association	https://www.escolasert.com/es/oferta-formativa/curso-taller-economia-circular-en-edificios
Decarbonization, circular economy & hidrogen	B-learning	60 h	NA	Escola Sert	https://web.unican.es/departamentos/ingquimica/estudios/detalle-estudios-propios?e=645
Composting course	B-learning	50 h	250	University of Cantabria	https://fuam.es/curso-corto/microcredencial-curso-de-maestria-en-compostaje-1a-edicion/
Specialist on Carbon Footprint and Energy Efficiency in organizations	B-learning	52,5 h	920	Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/especialista-en-huella-de-carbono-y-eficiencia-energetica/
Interoperabilidad. Optimización de los flujos de trabajo en entornos colaborativos bajo Metodología BIM para Proyectos de Infraestructuras y Obra Lineal	Multiple	37,5 h	385	Univeristy of Jaen	https://www.upo.es/formacionpermanente/microcredenciales/interoperabilidad-metodologia-bim/

Smart City y Gestión de la Movilidad. Un Enfoque Multidisciplinar	NA	NA	NA	Universidad Pablo Olavide	https://www.talent.upc.edu/esp/estudis/formacio/curs/321000/posgrado-smart-city-gestion-movilidad-enfoque-multidisciplinar/
Máster Universitario en Ingeniería de los Materiales y Construcción Sostenible	NA	NA	NA	University of Cantabria	https://www.ujaen.es/estudios/oferta-academica/masteres/master-universitario-en-ingenieria-de-los-materiales-y-construccion-sostenible
Microcredencial Universitaria en Técnicas de Gestión y Análisis Digital Espacial usando Metodologías GIS	Online	NA	347,13	University of Cantabria	https://web.unican.es/centros/minas/estudios-propios/detalle-estudios-propios?e=658
Aproximación a Business Intelligence (BI): «Visualización avanzada de datos desde Modelos BIM» y proceso de certificación de la ISO-19650	Online	37.5 h	385	Univeristy of Jaen	https://www.upo.es/formacionpermanente/microcredenciales/aproximacion-business-intelligence/
Civil 3D aplicado a proyectos viales	Online	7.59 h	USD 39	Universidad Pablo de Olavide	https://konstruedu.com/es/curso/civil-3d-aplicado-a-proyectos-viales
Aspectos complementarios. Gestion de la conservacion 3ª parte. (coex)	Online	60 h	Grant	Konstruedu	https://www.cursosenconstruccion.com/cursos-subvencionados/detalle/
Manejo de la herramienta unificada lider-calener (hulc). Curso práctico	Online	40 h	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/rehabilitacion-y-construccion-sostenible/
Aspectos generales en materia de prl (coex)	Online	60	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/conservacion-y-explotacion-de-carreteras-coex/
Interoperability. Optimization of workflows in collaborative environments under BIM Methodology for Infrastructure and Linear Works Projects	Online	1 month	385	NA	https://www.upo.es/formacionpermanente/microcredenciales/interoperabilidad-metodologia-bim/
Micrograde in industrial electronics and automatic	Online	NA	NA	Valladolid University	https://www.uned.es/universidad/inicio/estudios/microtitulos/microgrado-en-electronica-y-automatica-industrial.html
Micrograde in fundamentals of sustainable engineering	Online	NA	NA	Valladolid University	https://www.uned.es/universidad/inicio/estudios/microtitulos/microgrado-en-fundamentos-de-ingenierias-sostenibles.html

Micromaster in the internet of things	Online	NA	NA	UNED	https://www.uned.es/universidad/inicio/estudios/microtitulos/micromaster-en-internet-de-las-cosas.html
Building asessment report course - iee	Online	100 h	210	UNED	http://www.cscae.com/index.php/conoce-cscae/area-tecnica/curso-iee
Revit architecture	Online	120 h	1260	Universidad Autónoma de Madrid	https://formacion.coam.org/curso/3632/4041
Heritage bim: facility management	Online	1,5 h	free	Consejo Superior de Arquitectos de España	https://formacion.coam.org/curso/3624/4028
Heritage BIM: Scan to BIM	Online	1,5 h	free	Continuous Training Institute (IFC), Madird Offcial Architects´ Association (COAM)	https://formacion.coam.org/curso/3623/4027
Heritage BIM workshop	Online	1,5 h	free	Continuous Training Institute (IFC), Madird Offcial Architects´ Association	https://formacion.coam.org/curso/3632/4041
Building energy retrofit for EU Next Generation Aid	Online	20 h	290	Continuous Training Institute (IFC), Madird Offcial Architects´ Association	https://formacion.coam.org/curso/3584/3986
Autochthonous vegetation	Online	4 h	40	Continuous Training Institute (IFC), Madird Offcial Architectual Association	https://www.arquitectosdecadiz.com/aua03-24-curso-Online-vegetacion-autoctona/
CE3X + THERM Trainig course	Online	16 h	70	Valencia Territory Architectural Association	http://coavnbiz.org/evento/curso-practico-ce3x-therm/
Criteria and methodology for building inspection and retrofit	Online	9 h	60	BIskaia Architectural Association	http://coavnbiz.org/evento/21686/
Introduction to Corporate Sustainability	Online	45 h	340	Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/introduccion-a-la-sostenibilidad-corporativa/
Successful Techniques in the Environmental Sector	Online	37,5 h	320	Universidad Pablo de Olavide	https://www.upo.es/formacionpermanente/microcredenciales/tecnicas-de-exito-profesional-en-el-sector-ambiental/
Técnicas de gestión y análisis de información digital espacial usando herramientas gis	Online	3 ECTS	45	Universidad Pablo de Olavide	https://competencias-digitales.unican.es/
Integración de herramientas digitales geomáticas en minería	Online	3 ECTS	45	Universidad Pablo de Olavide	https://competencias-digitales.unican.es/integracion-de-herramientas-digitales-geomaticas-en-mineria/

De la internet de las cosas a la industria 4.0	Online	3 ECTS	45	Universidad de Cantabria	https://competencias-digitales.unican.es/de-la-internet-de-las-cosas-a-la-industria-4-0/
Excel para el éxito profesional (20ª Edición)	Online	1 ECTS	140	Universidad de Cantabria	https://fuam.es/curso-corto/microcredencial-excel-para-el-exito-profesional-20a-edicion/
Técnicas de éxito profesional en el sector ambiental	Online	5 ECTS	320	Fundación Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/tecnicas-de-exito-profesional-en-el-sector-ambiental/
Técnicas de gestión y análisis de información digital espacial usando herramientas gis	Online	3 ECTS	45	Universidad Pablo Olavide	https://competencias-digitales.unican.es/
Integración de herramientas digitales geomáticas en minería	Online	3 ECTS	45	Universidad Pablo Olavide	https://competencias-digitales.unican.es/integracion-de-herramientas-digitales-geomaticas-en-mineria/
De la internet de las cosas a la industria 4.0	Online	3 ECTS	45	Universidad de Cantabria	https://competencias-digitales.unican.es/de-la-internet-de-las-cosas-a-la-industria-4-0/
Excel para el éxito profesional (20ª Edición)	Online	1 ECTS	140	Universidad de Cantabria	https://fuam.es/curso-corto/microcredencial-excel-para-el-exito-profesional-20a-edicion/
Técnicas de éxito profesional en el sector ambiental	Online	5 ECTS	320	Fundación Universidad Autónoma de Madrid	https://www.upo.es/formacionpermanente/microcredenciales/tecnicas-de-exito-profesional-en-el-sector-ambiental/
Interoperability. Optimization of workflows in collaborative environments under BIM Methodology for Infrastructure and Linear Works Projects	Online	1 month	385	Universitat Politecnica de Catalunya	https://www.upo.es/formacionpermanente/microcredenciales/interoperabilidad-metodologia-bim/
Micrograde in industrial electronics and automatic	Online	NA	NA	Valladolid University	https://www.uned.es/universidad/inicio/estudios/microtitulos/microgrado-en-electronica-y-automatica-industrial.html
Micrograde in fundamentals of sustainable engineering	Online	NA	NA	UNED	https://www.uned.es/universidad/inicio/estudios/microtitulos/microgrado-en-fundamentos-de-ingenierias-sostenibles.html
Micromaster in the internet of things	Online	NA	NA	UNED	https://www.uned.es/universidad/inicio/estudios/microtitulos/micromaster-en-internet-de-las-cosas.html

Building asessment report course - iee	Online	100 h	210	Universidad Autónoma de Madrid	http://www.cscae.com/index.php/conoce-cscae/area-tecnica/curso-iee
Heritage bim: facility management	Online	1,5 h	free	Continuous Training Institute (IFC), Madird Offcial Architects´ Association (COAM)	https://formacion.coam.org/curso/3624/4028
Heritage BIM: Scan to BIM	Online	1,5 h	free	Continuous Training Institute (IFC), Madird Offcial Architects´ Association	https://formacion.coam.org/curso/3623/4027
Heritage BIM workshop	Online	1,5 h	free	Continuous Training Institute (IFC), Madird Offcial Architects´ Association	https://formacion.coam.org/curso/3632/4041
Building energy retrofit for EU Next Generation Aid	Online	20 h	290	Continuous Training Institute (IFC), Madird Offcial Architectual Association	https://formacion.coam.org/curso/3584/3986
Autochthonous vegetation	Online	4 h	40	Continuous Training Institute (IFC), Madird Offcial Architectual Association	https://www.arquitectosdecadiz.com/aua03-24-curso-Online-vegetacion-autoctona/
CE3X + THERM Trainig course	Online	16 h	70	Official Architectural Association of Navarra and Biskaia	http://coavnbiz.org/evento/curso-practico-ce3x-therm/
Criteria and methodology for building inspection and retrofit	Online	9 h	60	Universidad San Jorge/ Official Architectural Association of Aragón	http://coavnbiz.org/evento/21686/
Introduction to Corporate Sustainability	Online	45 h	340	Universidad Pablo de Olavide	https://www.upo.es/formacionpermanente/microcredenciales/introduccion-a-la-sostenibilidad-corporativa/
Successful Techniques in the Environmental Sector	Online	37,5 h	320	Universidad Pablo de Olavide	https://www.upo.es/formacionpermanente/microcredenciales/tecnicas-de-exito-profesional-en-el-sector-ambiental/
Microcredencial Universitaria en Técnicas de Gestión y Análisis Digital Espacial usando Metodologías GIS	Online	2 months	347,13	University of Ovideo	https://web.unican.es/centros/minas/estudios-propios/detalle-estudios-propios?e=658
Aproximación a Business Intelligence (BI): «Visualización avanzada de datos desde Modelos BIM» y proceso de certificación de la ISO-19650	Online	37.5 h	385	Universidad Pablo de Olavide	https://www.upo.es/formacionpermanente/microcredenciales/aproximacion-business-intelligence/

Civil 3D aplicado a proyectos viales	Online	7.59 h	39	Universidad Pablo de Olavide	https://konstruedu.com/es/curso/civil-3d-aplicado-a-proyectos-viales
Aspectos complementarios. Gestion de la conservacion 3ª parte. (coex)	Online	60 h	Grant	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/cursos-subvencionados/detalle/
Manejo de la herramienta unificada lider-calener (hulc). Curso práctico	Online	40 h	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/rehabilitacion-y-construccion-sostenible/
Aspectos generales en materia de prl (coex)	Online	60 h	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/conservacion-y-explotacion-de-carreteras-coex/
Fundamentals and integration of exponential technologies	Onsite	150 h	300	University of Ovideo	https://www.uniovi.es/estudia/titulospropios/microcredenciales/fundamentosexponenciales
Prl para trabajos de mecánica, mantenimiento y reparación de máquinas, equipos industriales y/o equipos electromecánicos. Parte especifica	Onsite	8 h	NA	Universidad Pablo de Olavide	https://www.cursosenconstruccion.com/seguridad-y-salud/
Smart city and mobility management. A multidisciplinary approach	Onsite	6 months	500	Fundación Laboral de Construcción	https://www.talent.upc.edu/esp/estudis/formacio/curs/321000/
Microdegree in digital electronics	Onsite	NA	466,2	UNED	https://uam.es/uam/microtitulo-electronica-digital
Passivhaus, Verde, and BREEAM Certifications	Onsite	15 h	NA	Continuous Training Institute (IFC), Madird Offcial Architectual Association	http://www.cscae.com/index.php/colegios-arquitectos60/canal-formacion-2/
Passivhaus, Verde, and BREEAM Certifications	Onsite	12 h	60	Cadiz Architectural Association	http://www.cscae.com/images/stories/Noticias/Colegios/
Smart city and mobility management. A multidisciplinary approach	Onsite	6 month	500	Universidad Pablo Olavide	https://www.talent.upc.edu/esp/estudis/formacio/curs/321000/
Microdegree in digital electronics	Onsite		466,2	UNED	https://uam.es/uam/microtitulo-electronica-digital
Passivhaus, Verde, and BREEAM Certifications	Onsite	15 h	NA	Cadiz Architectural Association	http://www.cscae.com/index.php/colegios-arquitectos60/canal-formacion-2/jornadas-tecnicas/
Passivhaus, Verde, and BREEAM Certifications	Onsite	12 h	60	Valencia Territory Architectural Association	http://www.cscae.com/images/stories/Noticias/Colegios/

Fundamentals and integration of exponential technologies	Onsite	150 h	300	Universidad Pablo de Olavide	https://www.uniovi.es/estudia/titulospropios/microcredenciales/fundamentosexponenciales
Prl para trabajos de mecánica, mantenimiento y reparación de máquinas, equipos industriales y/o equipos electromecánicos. Parte especifica	Onsite	8 h	NA	Konstruedu	https://www.cursosenconstruccion.com/seguridad-y-salud/
Rentabilidad de las actuaciones de rehabilitación y eficiencia energética en edificación	Others	20 h	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/rehabilitacion-y-construccion-sostenible/
Rentabilidad de las actuaciones de rehabilitación y eficiencia energética en edificación	Others	20 h	NA	Fundación Laboral de Construcción	https://www.cursosenconstruccion.com/rehabilitacion-y-construccion-sostenible/
Smart City y Gestión de la Movilidad. Un Enfoque Multidisciplinar	NA	NA	NA	NA	https://www.talent.upc.edu/esp/estudis/formacio/curs/321000/
Máster Universitario en Ingeniería de los Materiales y Construcción Sostenible	NA	NA	NA	NA	https://www.ujaen.es/estudios/oferta-academica/masteres/

Table 8. Liste of courses in Germany.

Germany					
Course Name	**Type**	**Course duration**	**Tuition Fee (€)**	**Awarding body**	**Link**
Jump - Training for Change	B-learning	NA	NA	Jump	https://www.trainingforchange.eu/
Water management and hydrology	B-learning	5 months	NA	Fakultät für Bauingenieurwesen und Geodäsie Leipniz Universität Hannover	https://www.fbg.uni-hannover.de/de/studium/studienangebot-der-fakultaet/wasser-und-umwelt
Nachhaltiges Bauen und Sanieren – Grundlagen der Nachhaltigkeit inkl. Ökobilanzierung und Lebenszykluskosten	Online	NA	415,31	GeWeB Weiterbildung im Bauwesen	https://geweb.de/Home/
Kompaktkurs Nachhaltiges Planen und Bauen	Online	3 months	1832,6	VDI Wissensforum	https://www.vdi-wissensforum.de/weiterbildung-bau/
Einführung in den Strohbau	Onsite	4 days	660	NA	https://www.biwena.de/veranstaltungen/
Fachkraft Strohballenbau (FASBA)	Onsite	NA	3150	BiWeNa in Kooperation mit dem FASBA und in pädagogischer VNB	https://www.biwena.de/events/weiterbildung-fachkraft-strohballenbau-2024/
Fachkraft DIN EN 22475	Onsite	NA	NA	LUXCERT GmbH	NA
Fachkraft Geothermie	Onsite	NA	NA	LUXCERT GmbH	NA
Erwerb der Sachkunde nach Nr. 2.7 TRGS 519 Anlage 4C - Asbestabbruch, Sanierung und Instandhaltung von Asbestzementprodukten im Hoch- und Tiefbau	Onsite	1 day	545	BAU-Akademie Nord	BAU-Akademie-Nord - Erwerb der Sachkunde nach Nr. 2.7 TRGS 519 Anlage 4C - Asbestabbruch,... (bauakademie-nord.de)

Table 9. Liste of courses in Greece.

Course Name	Type	Course duration	Tuition Fee (€)	Awarding body	Link
Methods of Environmental Restoration	B-learning	50-200 h	free (grant)	Center for Education and Lifelong Learning Euclides	https://eyklidis.gr/index.php/courses/
Smart Home & Smart Cities-App. Remote Control	B-learning	50-200 h	Free (grant)	National and Kapodistrian University of Athens	https://eyklidis.gr/index.php/courses/
Waste management	B-learning	50-200 h	Free (grant)	National and Kapodistrian University of Athens	https://eyklidis.gr/index.php/courses/
Assessment of the Environmental Impact of a Project	B-learning	100 h	NA	ACTA - Spin off of Aristotle University of Thessaloniki	https://kedivim.uniwa.gr/course/ektimisi-ton-perivallontikon-epiptoseon-enos-ergoy/
TB111 DRY STRUCTURE SYSTEMS KNAUF	B-learning	2-3 Online + 2 days Onsite	160	TÜV HELLAS	https://www.knauf.gr/seminars/seminar-tb111-20240201.html#showtab-tab3342628_3
PF411 – VIEWS OF DRY STRUCTURE & THERMOPROSOPSIS	B-learning	2-3 Online + 2 days Onsite	160	GREEK PASSIVE BUILDING INSTITUTE	https://www.knauf.gr/seminars/seminar-pf411-20240328.html#showtab-tab3561335_3
BS111 – FIREPROOF SEAL SYSTEMS	B-learning	2-3 Online + 2 days Onsite	160	NA	https://www.knauf.gr/seminars/seminar-bs111-20241212.html#showtab-tab3561353_3
3D AutoCAD: 3D Modeling and advanced 2D applications	E-learning	90 h	380	University of Western Attica	https://kedivim.uniwa.gr/course/3d-autocad-yvridiko-montelopoiisi-se-3-diastaseis-kai-proigmenes-efarmoges-2-diastaseon/
Application of KENAK regulation and KENAK - TEE software for conducting energy instections of buildings	E-learning	36 h	280	ACTA - Spin off of Aristotle University of Thessaloniki	https://kedivim.uniwa.gr/course/efarmogi-kanonismoy-kenak-kai-logismikoy-kenak-tee-gia-tin-diexagogi-

					energeiakon-epitheoriseon-ktirion/#single-course-description-section
Site Engineer	E-learning	125 h	300	ACTA - Spin off of Aristotle University of Thessaloniki	https://kedivim.uniwa.gr/course/michanikos-ergotaxioy/
Construction Works of Technical Residential Projects	E-learning	10 h	120	ACTA - Spin off of Aristotle University of Thessaloniki	https://www.semigo.gr/seminario_oikodomiki_ergasies_kataskeuis_texnikon-ergon/
On site safety training	NA	NA	NA	National and Kapodistrian University of Athens	https://www.gepgroup.gr/en/on-site-safety-trainings
Skillfull Generations Program	NA	NA	NA	Center for Education and Lifelong Learning Euclides	https://www.gekterna.com/en/media-center/our-stories/h-nea-genia-sto-epikentro-twn-xorhgikwn-drasewn-toy-omiloy-gek-terna
Construcion Managment train course	Online	8	1195	NA	https://www.theknowledgeacademy.com/gr/courses/health-and-safety-in-the-workplace/construction-management-training-course
Special Issues on the Energy Efficiency of Buildings	Online	120 h	800	Center for Education and Lifelong Learning Euclides	https://cce.uoa.gr/courses-detailed/a872d78f-a033-4f79-986b-78475a13e12d
Smart Building Installations	Online	80 h	450	Architectural Aluminium Academy	https://cce.uoa.gr/courses-detailed/5bcd9231-899f-432a-88c4-612e82495f94
Design and Optimization of Zero Energy Consumption Buildings	Online	26 weeks	700	National and Kapodistrian University of Athens	https://elearninguoa.org/course/environment-architecture/design-and-optimization-zero-energy-consumption-buildings
Introduction to Energy and Bioclimatic Design of Buildings and Urban Structures	Online	100 h	800	National and Kapodistrian University of Athens	https://cce.uoa.gr/courses-detailed/9f52da40-9a94-4f00-a0e7-fb97f3b418fa

Climate Change and Landscape Technology	Online	60 h	450	Foundación Laboral de la Costrucción	https://cce.uoa.gr/courses-detailed/1a4f8564-ad28-47cc-aea0-9bde840c37e1
Sustainable Energy Design of Buildings and Built Environment	Online	350 h	1500	Amici della Terra	https://cce.uoa.gr/courses-detailed/948f9caf-d5a5-44f7-9734-37ac0461ffd1
Training on Green Roofs	Online	25 h	free	University of Western Attica Training & Lifelong Learning Center	https://naturbuild.eu/en/course/
Building Capacities of Public Authorities towards meeting public buildings stock innovation challenges	Online	40 h	Free	Amici della Terra	https://capable.formedil.it/login/index.php
Training for Aluminium Frames Technicians	Onsite	600 h	NA	National and Kapodistrian University of Athens	https://aluminiumacademy.com/en/product/seminars/aluminium-frame-technician/
Certified Passive Haus Tradesperson	Onsite	18 h	NA	GREEK PASSIVE BUILDING INSTITUTE	https://eipak.org/trades2020
Renewable Energy Technician	Others	NA	NA	ACTA - Spin off of Aristotle University of Thessaloniki	https://acta-edu.gr/certificate/technikos-ananeosimon-pigon-energeias/
Welding and Metal Cutting Technician	Others	NA	NA	ACTA - Spin off of Aristotle University of Thessaloniki	https://acta-edu.gr/certificate/technikos-sygkolliseon-kai-kopis-metallon/
Insulation Technician - Insulator	Others	NA	NA	ACTA - Spin off of Aristotle University of Thessaloniki	https://acta-edu.gr/certificate/technikos-monosis-monotis/
Oil Painting Technician (Theoretical Level)	Others	NA	NA	TÜV HELLAS	https://acta-edu.gr/certificate/technitis-elaiochromatistis/

Dry Building Systems Technician - Gypsum Craftsman	Others	NA	NA	TÜV HELLAS	https://acta-edu.gr/certificate/technitis-systimaton-ksiras-domisis-gypsotechnias/

Table 10. Liste of courses in other countries.

Others Countries					
Course name	**Type**	**Course duration**	**Tuition Fee**	**Awarding body**	**Link**
Modern Methods of Construction	B-learning	8 weeks	1850	UCC- University College Cork	https://microcreds.ie/partners/university-of-galway/offerings/modern-methods-of-ehjq-7
Digital Construction Technologies	B-learning	8 weeks	1850	UCC- University College Cork	https://microcreds.ie/partners/university-of-galway/offerings/digital-construction-euns-7
Emerging Leaders in Construction	Multiple	6-8 weeks	NA	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/emerging-leaders-in-construction/?cl=1
Cost Management in Construction	Multiple	6-8 weeks (50 h)	USD 1.500	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/cost-management-in-construction/?cl=1
Experienced Leaders in Construction	Multiple	70 h	$3,000	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/experienced-leaders-in-construction/?cl=1
Building Information Modelling (BIM) in Construction	Multiple	50 h	$1,500	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/building-information-modelling-bim-in-construction/?cl=1
Introduction to Building Information Modelling (BIM) in Construction	Multiple	20 h	NA	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/introduction-to-building-information-modelling-bim-in-construction/
2D CAD Drawings and 3D Models in Construction	Multiple	6-8 weeks	$1,500	Institute of Applied Technology	https://study.iat.nsw.edu.au/courses/2d-cad-drawings-and-3d-models-in-construction/

Sustainability, Energy Optimization (NEO) and CO2 Neutrality in Construction	Multiple	100 h	3450 €	University of Applied Sciences	https://www.fh-kaernten.at/en/weiterbildung/microcredentials-and-degrees/
Applied Circular Economy: Zero Waste Buildings	Multiple	NA	NA	BCIT	https://www.bcit.ca/programs/applied-circular-economy-zero-waste-buildings-microcredential-part-time-0816cm/#delivery
Sustainability and Climate Change for Construction Industry	Multiple	1 semester	$1,224.6 or $5,582.5	BCITO - a Business Division of Te Pūkenga - New Institute of Skills and Technology	https://www.massey.ac.nz/study/courses/sustainability-and-climate-change-for-construction-industry-218715/
Green Buildings - Design and Construction	NA	44 h	NA	GreenSkills Academy	https://greenskills.in/course/green-buildings-design-and-construction/#1582786207907-67c772f5-a27f
Sustainable Reuse of Existing Structures	NA	NA	NA	University of Galway	https://www.massey.ac.nz/study/courses/sustainability-and-climate-change-for-construction-industry-218715/
Microcredential in Basic Construction Skills	NA	6 months	NA	Universidade Massey	https://bcito.org.nz/employers/micro-credentials/basic-construction-micro-credential/
Microcredential in On-Site Assembly	NA	NA	NA	Universidade Massey	https://bcito.org.nz/employers/micro-credentials/-site-assembly-skills-micro-credential/
Sustainable constructions	Online	360 h	R$ 668,38	IPETEC	https://www.ipetec.com.br/curso/construcoes-sustentaveis/
Sustainable Project Management in Construction	Online	3 days	$1995	Algonquin College	https://www.algonquincollege.com/corporate/course/sustainable-project-management-in-construction/
Revit Architecture Fundamentals	Online	36 h	USD 875	SAIT	https://coned.sait.ca/search/publicCourseSearchDetails.do?method=load&courseId=1026456

Whole-Building Life Cycle Assessment Final Project	Online	10 h	651 €	British Columbia Institute of Technology	https://www.tradeupbc.ca/course-offerings/construction-trades/
Green Building Rating Systems	Online	30 weeks	$ 1.042,81	Thompson Rivers University	https://www.tru.ca/distance/courses/aret4111.html
Introduction to green buildings	Online	NA	44,99 €	Udemy	https://www.udemy.com/course/intro-green-buildings/?couponCode=2021PM20
Construction Technology and Innovation	Online	4 to 6 h	US$ 199	Project Management Institute	https://www.pmi.org/certifications/construction/technology-and-innovation
Construction Performance and Materials Management	Online	4 to 6 h	US$ 200	Project Management Institute	https://www.pmi.org/certifications/construction/performance-and-materials-management
Traditional timber houses carpentry in seismic and coastal areas	Online	35 h	NA	Technical University of Civil Engineering Bucharest	https://www.eu-conexus.eu/credential/traditional-timber-houses-carpentry-in-seismic-and-coastal-areas/
Challenges in Antibiotic Resistance: Gram Negative Bacteria	Online	9	£79	Royal College of Pathologists	https://www.futurelearn.com/courses/gram-negative-bacteria
Low Carbon Consultant (LCC)	Online	16 h	£290.00 +VAT	Chartered Institution of Building Services Engineers (CIBSE)	https://www.cibsecertification.co.uk/personnel-certification/low-carbon-consultant-lcc/
Low Carbon Energy Assessor (LCEA)	Online	16 h	£300 + VAT and £315 + VAT	Chartered Institution of Building Services Engineers (CIBSE)	https://www.cibsecertification.co.uk/personnel-certification/low-carbon-energy-assessor-lcea-to-produce-non-domestic-epcs/
Certification ESOS Lead Assessor	Online	NA	£250	Chartered Institution of Building Services Engineers (CIBSE)	https://www.cibsecertification.co.uk/personnel-certification/esos-lead-assessor/
CIBSE Certification Heat Networks Consultant	Online	NA	£290 + VAT	Chartered Institution of Building Services Engineers (CIBSE)	https://www.cibsecertification.co.uk/personnel-certification/heat-networks-consultant/

CIBSE Section 63 Advisor	Online	NA	NA	Chartered Institution of Building Services Engineers (CIBSE)	https://www.cibsecertification.co.uk/personnel-certification/section-63-advisor/
Regenerative Development for the Built Environment	Online	15 h	$1200	Green Building Education Services	https://gbes.com/catalog/certificate-programs/product-intro-to-living-systems-thinking-regenerative-design-education/
SLP in green building applications	Onsite	70 h	NA	University of Johannesburg	https://www.uj.ac.za/university-courses/short-learning-programme/
Building Information Modelling (BIM) microcredentials	Onsite	3-6 days	$2,725 - $5,450	Bond University	https://bond.edu.au/microcredential/building-information-modelling-bim-microcredentials
Foundations of Intelligent Construction (OpenBIM) Microcredential	Onsite	3 days	$ 2.780	Bond University	https://bond.edu.au/microcredential/bim-foundations-of-intelligent-construction-openbim-microcredential
Managing Complexity in Construction (Maximising Value)	Onsite	4 days	$5560	Bond University	https://bond.edu.au/microcredential/bim-managing-complexity-construction-maximising-value
BIM for Environment Sustainability Assessment	Onsite	3 days	$2,780	Bond University	https://bond.edu.au/microcredential/bim-bim-for-environment-sustainability-assessment
Construction of green buildings	Onsite	35 weeks	NA	Brighton College	https://brightoncollege.com/programs/green-building-and-sustainable-design-diploma/
Bauen im Klimawandel Wirksame Massnahmen für Bauherrschaften und Planende	Onsite	NA	1200 CHF	University Luzern - Institut für Gebäudetechnik und Energie IGE	https://www.hslu.ch/de-ch/technik-architektur/weiterbildung/fachkurse/bauen-im-klimawandel
Pre-Construction Planning	Onsite	3-4 semesters	NA	Farmingdale State College - State University of New York	https://www.farmingdale.edu/provost/microcredentials/pre-construction-planning.shtml

Micro Credentials in Construction

Work Package 2 Baseline and Enabling Framework