

# WIP: Improving digital course catalogues for an enhanced mobility in the Erasmus higher education context

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**Abstract**— This research WIP paper describes the DACEM project, aimed at enhancing course catalogues to support the objectives of the Erasmus+ program. Within Erasmus+, course catalogues serve as essential tools for students in their quest for suitable academic opportunities and for institutions in negotiating bilateral agreements on shared programs. Despite numerous initiatives and years of experience, European higher education institutions still face significant challenges in providing appropriate course catalogues, which directly impacts student mobility. This paper conducts an analysis of the current course catalogues situation in 7 European countries (Estonia, France, Greece, Hungary, Portugal, Slovenia, and Spain), examining general trends, the availability of solutions, and key difficulties. Additionally, it evaluates the needs and use cases of end users and stakeholders, highlighting the essential technical features that course catalogue software solutions should encompass. By compiling key requirements, this paper contributes towards the development of appropriate and sustainable course catalogues for Higher Education Institutions.

**Keywords**—course catalogue, Erasmus+, student mobility

## I. INTRODUCTION

Generally, international student mobility is widely regarded as beneficial in various aspects by many stakeholders within the higher education system, policy makers and employers [1]. It exposes students to a diversity of teaching methods, work practices, cultures, and perspectives, thereby contributing to the development of valuable competences for their professional and personal lives, such as transversal skills, communication abilities, language proficiency, and intercultural awareness. Additionally, most students who study abroad return with a better understanding of themselves and their values, as well as a broadened worldview. They also gain confidence in adapting to new environments, leading to a more successful life the challenges of internationality.

In the European context, the Erasmus program was launched in 1987 under the acronym European Region Action Scheme for the Mobility of the University Students. It was

introduced as an exchange initiative offering university students the opportunity to learn and enrich their studies at other European Higher Education Institutions (HEIs). Over the years, the program has expanded its mobility objectives, extending beyond students to include professors and university staff. Initially limited to European Union member states, it has gradually opened up to include participation from other countries worldwide. The program has gone through several updates: in 1995, it was integrated into the Socrates program, and in 2007, it became part of the LifeLong Learning Programme (LLP). In 2014, it underwent a renaming to Erasmus+ with the aim of enhancing the quality and strengthen the European dimension of higher education. This involved promoting transnational cooperation between universities, fostering mobility in Europe, and improving transparency and full academic recognition of studies and qualifications.

Student mobility among HEIs, mainly when it is intended in different countries, presents various challenges, particularly those stemming from incompatibilities among programs and systems, such as differences in the academic calendar, language requirements, academic prerequisites, and the recognition of the studies at the home institution [2]. In response to these challenges, the Erasmus+ program has developed several tools, with the Course Catalogue (CC) being one of the key resources. The CC is designed to provide comprehensive information about HEIs as institutions and their academic offerings, including full degree programs and individual courses, as well as practical details about living conditions, such as social and cultural opportunities, sports facilities, medical services, and accommodation options. This information is made available openly to both other institutions and foreign students, facilitating the exploration and analysis of opportunities for collaborations and mobilities. HEIs can use this information to make informed decisions about potential partnerships and opportunities for student mobility. Similarly, students can utilize the CC to assess and compare mobility options available to them.

Despite the efforts made by European institutions through the various Erasmus programs and the general positive results [3; 4], studies do not support the view that students' mobility is a more or less perfect "success story" [1]. This fact is clearly reflected as a major problem in the surveys filled in by our Erasmus students: "*CC information is very often not updated*

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*properly*”, “*rights of the students when it comes to the evaluation mechanism... what happens if examinations are not passed*”, “*what about enrollment deadlines for courses*”, etc. The latest data from the students' association ESN survey in 2021 [5] shows that less than 80% of study achievements obtained abroad receive full recognition, which is far from the objective of automatic recognition set within the European Education Area. As observed, many of these issues are related to the information that should be provided through CCs.

This paper introduces the DACEM project, an Erasmus+ initiative aimed at addressing the current challenges related to HEIs' CCs. The project aims to provide a CC solution for HEIs that can maintain up-to-date information about courses and institutions in a manner that is accessible, comprehensive, consistent, timely, and interoperable. Among its objectives, the project includes tasks such as conducting a comprehensive mapping of the current situation regarding existing CCs, analyzing end-user and stakeholder needs, and adopting new technologies to develop an open-source solution and cloud platform for CCs.

The remaining sections of the paper are organized as follows: The next section includes a discussion of the Erasmus+ regulations concerning CCs. Following that, Section III provides an overview of the current state of CCs in the countries of the DACEM partners. Next, end users, stakeholders, and main capabilities for CCs are reviewed. The paper concludes with reflections on the present status and objectives of the DACEM project.

## II. ERASMUS+ REGULATIONS ON CCs

The European Higher Education Area (EHEA) is a collaborative effort among European countries to create a unified and cohesive higher education system across the continent. Established in 1999 with the signing of the Bologna Declaration, the EHEA aims to promote mobility, quality assurance, and recognition of qualifications within Europe.

The European Credit Transfer and Accumulation System (ECTS) is a key tool within the EHEA designed to facilitate the recognition and transfer of credits between HEIs across Europe. The ECTS is based on the principle of transparency in the learning, teaching, and assessment processes. It helps universities and students navigate the complexities of credit systems, ensuring that academic achievements are accurately recognized and valued across borders. ECTS aims to facilitate the planning, implementation and evaluation of study programmes and student mobility by recognizing learning achievements and qualifications as well as learning periods.

### A. The ECTS User's Guide

The ECTS User's Guide [6] serves as the primary reference for understanding and implementing the ECTS system. It offers comprehensive guidelines and recommendations for ensuring the effective utilization of ECTS. Specifically, the Guide outlines the essential data elements to be incorporated into the main mobility documents and the CC. According to the ECTS User's Guide, the CC must contain detailed, user-friendly, and current information about the learning environment of the institutions. Moreover, it mandates that the CC be publicly accessible on the institution's website, presenting course/subject titles in at least two languages: English and a national or regional language, if applicable. This information should be readily available to prospective students prior to enrollment and throughout their

academic journey. Furthermore, in the context of student mobility, the CC should empower students to efficiently search for and identify suitable study opportunities.

The ECTS User's Guide proposes an organized structure for the information presented in various sections:

- **General Information:** This section includes essential details about the institution, such as name, address, type, academic calendar, and admission requirements. It also provides information relevant to prospective students, including programs offered, registration procedures, language policy, and provisions for credit recognition and prior learning.
- **Resources and Services:** Information regarding general living conditions, medical assistance, social and working opportunities, sports facilities, student associations, language courses, and job placement services is included.
- **Programme Information:** This section details specific academic programs at various levels (degree, master's, doctoral). It includes information such as the level of qualification, program length, credit allocation, admission requirements, learning outcomes, qualification requirements, and regulations. A notable component is the program profile [7], which highlights the program's distinctive features, generic and subject-specific competencies, and employability potential.
- **Information on Individual Educational Components:** This section focuses on individual educational components, which may include subjects or courses, internships, work placements, research projects, or entrepreneurship ventures. Each component aims to achieve specific learning outcomes and is accessible to mobility students.

### B. Bilateral and Learning Agreements

Institutions within the EHEA often establish Bilateral Agreements or partnerships to facilitate student mobility. These agreements outline the terms and conditions of cooperation, including the exchange of students, academic recognition, and other collaborative activities. Bilateral agreements ensure that both sending and receiving institutions agree on the principles and procedures for student exchanges.

Once a Bilateral Agreement is in place, students interested in participating in a mobility program must develop an individual Learning Agreement at their home and host institutions before embarking on a period of mobility. This agreement outlines the specific courses or academic activities the student will undertake during their mobility period. It typically includes details such as the names of the courses, the number of ECTS credits, and the assessment methods. The Learning Agreement necessitates signatures from the student, as well as representatives from both the home and host institutions.

Overall, CCs play a critical role in facilitating student mobility within the EHEA by providing essential information for the development of Bilateral Agreements, Learning Agreements, and the overall student mobility experience. They ensure transparency, alignment with academic programs, and quality assurance, ultimately enhancing the effectiveness and success of European student mobility initiatives.

### C. Quality Assurance and Standards

The Erasmus Charter for Higher Education (ECHE) plays a pivotal role within the Erasmus+ program, offering a quality framework for cooperation activities among HEIs, both inside and outside the European Union. According to the ECHE Monitoring Guide published in February 2023 [8], HEIs are expected to have implemented eGovernment by 2023, with efforts towards this goal being assessed by National Agencies. CCs are integral to this roadmap, representing a fundamental principle of mobility that requires monitoring. As outlined in the ECHE Monitoring Guide (page 9), institutions are required to publish and regularly update their CCs on their websites well in advance of mobility periods. This transparency is crucial for all stakeholders, enabling prospective incoming students to make informed decisions about their chosen courses. The assessment criteria detailed in the guide (page 18) for National Agencies include the timely publication of CCs (prior to the signing of learning agreements), completeness, regular updates for upcoming semesters/academic years, accessibility on the institution's website, and availability in widely spoken languages.

### III. OVERVIEW OF CCs IN EUROPEAN HEIs

In the context of the DACEM project, we conducted a study on the status of existing CCs in several European countries. Below are the main findings of this research:

- In Estonia, HEIs utilize a student information management system called õppeinfosüsteem (ÕIS). This system encompasses a Student Portal, serving as a central hub for tracking students' study results, facilitating course registration, and managing applications. Additionally, academic administrators rely on ÕIS for counseling students and assisting lecturers. This system includes a CC that provides most of the information required by the ECTS Users' Guide. Nevertheless, while some universities, like the University of Tartu, use this CC, others, such as Tallinn University, opt to list incoming exchange courses separately on an Incoming Exchanges page for easier accessibility. Exchange students at Tallinn University can utilize this page to select courses prior to their arrival, with the option to later access ÕIS for course registration upon enrollment. The list of Incoming Exchange Courses is updated biannually through an Excel file on Google Drive, compiled from input provided by Departmental Erasmus Coordinators. Another prominent Estonian HEI, TalTech, offers both options: utilizing ÕIS and maintaining an Incoming Exchanges page.
- In France, universities have considerable autonomy in developing individual solutions for CCs, but this freedom also poses challenges. While it is mandatory for French universities to inform students about assessment procedures for each course, there are no specific instructions regarding CCs, making it difficult to find CCs fully compliant with European standards. Often, CCs are only available in English for degree courses taught in that language. Compliance with 2015 ECTS user guidelines is generally observed for general information, but more specific details, such as academic authorities or arrangements for academic guidance, are harder to locate. Information about facilities for students with disabilities is not consistently emphasized. While basic information like accommodation and cost of living is easily accessible, details about daily life amenities vary among institutions. APOGEE is the most widely used academic management tool in French universities, developed by the AMUE (*Agence de mutualisation des universités et établissements d'enseignement supérieur et de recherche*). However, it lacks detailed course information. French universities typically use ad-hoc solutions or the AMETYS Campus software for CCs, both of which interface with APOGEE.
- In Greece, there is no solution for maintaining comprehensive course information in accordance with the ECTS Users' Guide. HEIs follow a decentralized approach, that results in fragmented and inconsistently arranged data across institutional websites, potentially confusing users, especially prospective visiting students, who may struggle to find critical details such as admission requirements or credit recognition arrangements. While universities offer general information and resources like student affairs offices and accommodation details, specifics such as cost of living or facilities for students with disabilities may not always be readily accessible. Furthermore, program information varies in clarity and organization among universities, with some providing clear structures while others present excessive, disorganized information, which hampers effective navigation.
- In Hungary, the most advanced example of a CC is found at Eötvös Loránd University (ELTE), which reasonably adheres to the ECTS guidelines. However, the most common type of public CC solution nationwide, found in the majority of analyzed HEIs, consists of collections of PDF files that are difficult to navigate and lack essential information. Although there is a widespread education management system called NEPTUN.NET used in all analyzed HEIs, only a few, with ELTE being the sole example found, have taken the initiative to organize courses by availability for mobility and make the CC accessible within an otherwise closed system. Regarding the establishment of course equivalences between university courses, which could be facilitated by an interoperable, machine-readable course catalogue, there is only one known pilot project hosted by ELTE. While offering future potential, this pilot project requires registration and currently lacks sufficient data to be considered useful.
- In Portugal, HEIs offer CCs in diverse ways. Some institutions like the Polytechnic Institute of Porto or the University of Lisbon provide information on their websites, although it may be scattered and lack uniform presentation. Others, like the University of Minho (UMinho) and the University of Porto (U.Porto), offer comprehensive program details and course lists with versatile search options, ensuring accessibility to detailed course information. The University of Coimbra (UC) and the University of Aveiro (UA) also provide extensive course information through easily accessible CCs, facilitating seamless navigation. Additionally, the Directorate-General for Higher Education (DGES) maintains a website offering comprehensive information on

various aspects of higher education, including a course choosing assistant with catalogues from public and private universities and polytechnics. These varied approaches reflect differences in accessibility, organization, and user experience across Portuguese HEIs.

- Slovenian public universities have adopted diverse approaches to publish their CCs. The University of Ljubljana employs a decentralized method, with each faculty producing its own catalogue, often available on the website or as an Excel document. However, the quality of these CCs varies depending on the faculty. In contrast, the University of Maribor and the University of Primorska have centralized CCs. The University of Primorska offers an online interface for students to access relevant courses through filters in a single catalogue. Meanwhile, the University of Maribor integrates its computerized CC into the application process for student exchange, allowing students to apply and select courses simultaneously. Additionally, to aid course search, the CC is available on the university website in PDF and Excel, facilitating filtering and sorting for incoming mobility students.
- In Spain, universities generally lack a specific CC solution. The required information is often spread across multiple pages, making navigation complex and potentially confusing for users. However, there are notable exceptions such as the Universidad de Granada, which offers a CC fully compliant with the ECTS Users' Guide, and the Universidad de Almeria, which provides a robust solution with integrated functionalities focused on supporting visiting students. In other cases, the information provided is primarily aimed at local students, with limited emphasis on visiting students. Specific elements such as admission requirements, credit recognition arrangements, and academic guidance may not always be readily available or easy to locate. Similarly, while universities commonly offer information on general resources and services like student affairs offices and accommodation, details on cost of living, financial support, medical facilities, and work placement opportunities are less commonly available and may be scattered across different locations. The level of detail and organization regarding academic programs varies significantly among universities. However, information on individual educational components is typically comprehensive, as mandated by Spanish law, but primarily focused on regular students.

From the previous review is inferred that the current state of CCs in European HEIs displays considerable diversity and presents common challenges. While some (few) institutions boast comprehensive and accessible CCs, others exhibit less structured or less accessible catalogues. In any case, most HEIs across Europe lack CCs that fully align with the requirements and recommendations of the Erasmus+ programme, with digitization proving a complex endeavor due to entrenched academic cultures and technical hurdles. Challenges persist in making CCs available, accessible, and interoperable, particularly in English and machine-readable formats. Despite investments in digital systems, full digitization remains elusive.

Interoperability poses another significant challenge, as HEIs often operate separate CC solutions with limited compatibility, hindering communication and information sharing. Standardization and interoperability efforts, particularly within the European Universities initiative, are essential for enhancing the effectiveness and integration of CCs across HEIs.

#### IV. CCs END USERS, STAKEHOLDERS, USE CASES, AND KEY FEATURES

To enhance CCs and promote student mobility, it is vital to consider the end users and stakeholders, along with their specific use cases and the key features to be supported. In line with the objectives of the DACEM project, a comprehensive review was undertaken with a focus on these aspects.

##### A. End Users

There are several individuals or groups who use CCs:

- Incoming and outgoing exchange students: They are primary end-users of CCs, seeking courses at their host institutions that align with their curriculum and can transfer back to their home institutions. Understanding course equivalencies between their home and host institutions is crucial for them.
- Mobility Program Coordinators: These individuals within HEIs manage and facilitate student mobility programs like Erasmus+ or other exchange programs. They rely on CCs to assist students in selecting suitable courses, ensure credit transfer compatibility, and provide support during mobility periods.
- Current students: They utilize CCs to find information about mandatory or elective courses within their own programs. CCs help them plan their academic path, choose courses, and understand degree requirements.
- Prospective students: This group includes secondary school pupils or undergraduate students from other universities who use CCs to explore courses offered by institutions and make informed decisions about their study choices.
- Career Advisors and Guidance Counselors (including those in secondary schools): They use CCs to understand the skills and knowledge gained from specific courses, program requirements, and academic pathways, helping guide students towards suitable career paths.
- Employers and Industry Representatives: These individuals refer to CCs to understand the skills and knowledge areas that graduates possess and to recruit talent.
- Government and Accreditation Bodies: They use CCs to assess the quality and relevance of programs offered by HEIs and ensure compliance with educational standards.
- International Partners and Institutions: Prospective partners, such as those in the context of European University Alliances (EUA), refer to CCs to understand the academic offerings and standards of HEIs in other European countries for potential collaboration or student exchange programs.

- Teaching and Academic Staff: They utilize CCs to some extent when designing new programs or courses, as they may be interested in how similar programs or courses have been structured.

### B. Stakeholders

Stakeholders encompass individuals responsible for CC development, population, maintenance, and operation. Main stakeholders for CCs include:

- Teaching staff: Regular professors and teachers lecturing at HEIs should provide information on individual educational components for CCs.
- Academic staff: This includes deans, department heads, or coordinators, who should offer information about specific programmes. In some cases, they also compile courses offered to international students.
- University staff: Especially those in "student services", admission officers, and international relations offices, are responsible for managing CC information regarding general regulations, resources, and services.
- University Administrators: They create and maintain process workflows, timelines, and enforce deadlines, ensuring that the information is accurate, up-to-date, and complies with institutional and national standards.
- Quality Assurance Teams: Responsible for the quality of the institution's academic offerings, they ensure compliance with quality standards, including the ones regarding CCs. They should strive to standardize and validate data received from other staff members.
- IT services: Involved in the technical setup and maintenance of IT tools, including the CC system, they ensure that data provided by different stakeholders can be consolidated into a central repository, ideally tracking changes, and storing historical data.

### C. Key Features

In addition to the use cases for end users and stakeholders, CC solutions should support various functionalities and capabilities. Integration with existing IT infrastructure within the HEI, such as administrative databases, is crucial for consolidating data from different stakeholders involved in CC development and maintenance, ensuring centralized and accessible information. Standardized data formats and protocols should be employed to facilitate interoperability between different systems and platforms, enabling seamless information exchange [9]. Tools for data mapping and transformation are necessary to ensure compatibility and effective integration of information from diverse sources into the CC system. APIs (Application Programming Interfaces) and web services are required to enable communication and data exchange between different systems and applications. Data security measures are essential to guarantee integrity, including version control and audit trails to track changes made to the CCs over time, ensuring transparency, accountability, and compliance with institutional policies and regulations. Moreover, CC solutions should ensure scalability and flexibility to accommodate future growth and changing requirements, allowing for the addition of new features, integration with emerging technologies, and support for increasing volumes of data.

## V. CONCLUSIONS AND FUTURE WORK

The recently approved DACEM Erasmus+ project aims to address existing challenges related to CCs in HEIs, ensuring the provision of updated and comprehensive information about courses and institutions in a manner that is accessible, complete, coherent, timely, and interoperable. Understanding the current situation and identifying key issues is crucial for achieving this goal.

This work-in-progress research paper offers an overview of the CC situation in 7 European countries, highlighting that most HEIs lack appropriate CCs, which may impede student mobility opportunities across Europe. Key challenges such as the lack of integration with existing IT systems and the difficulty in maintaining the large volume of data involved in a consistent and efficient manner have been identified. However, noteworthy exemplary solutions have emerged in nearly all countries, offering valuable reference points and indicating institutions' interest in addressing this area.

Furthermore, the analysis presented reviews of end users, stakeholders, and key features that should be considered in the development of CC solutions. By identifying these issues and perspectives, we take a significant step toward improvement in this field. It is imperative for HEIs to acknowledge these challenges and explore new options that can help address them effectively. With this awareness and proactive approach, HEIs can work toward enhancing the accessibility and functionality of CCs, thereby facilitating smoother student mobility experiences and fostering collaboration within the European Higher Education Area.

## REFERENCES

- [1] U. Teichler. "Internationalisation trends in higher education and the changing role of international student mobility". *Journal of international Mobility* 4, pp. 177-216, 2017.
- [2] C. López-Duarte, J. F. Maley, and M. M. Vidal-Suárez. "Main challenges to international student mobility in the European arena." *Scientometrics* 126, no. 11, pp.8957-8980, 2021.
- [3] V. Jacobone, and G. Moro. "Evaluating the impact of the Erasmus programme: skills and European identity." *Assessment & Evaluation in Higher Education* 40, no. 2, pp. 309-328, 2015.
- [4] L. C. Ferreira-Pereira, and J. Mourato Pinto. "Soft power in the European Union's strategic partnership diplomacy: The Erasmus Plus Programme." *The European Union's Strategic Partnerships: Global Diplomacy in a Contested World*, pp. 69-94. 2021.
- [5] G. Telesca, E. Puchkov, S. Keshelashvili, G. Gruttad'Aria, K. Giannidis. "Understanding the Experience & Needs of Exchange Students in Challenging Times", *ESNsurvey*, XIV Edition, 2023.
- [6] European Commission, Directorate-General for Education, Youth, Sport and Culture, *ECTS users' guide 2015*, Publications Office of the European Union, 2015, <https://data.europa.eu/doi/10.2766/87192>
- [7] J. Lockhoff, B. Wegejis, K. Durkin, R. Wagenaar, J. Gonzalez, L. Dalla Rosa, A. Katherine Issacs, and M. Gobbi. "A guide to formulating degree programme profiles. Including programme competences and programme learning outcomes". University of Deusto, 2011.
- [8] European Commission, Directorate-General for Education, Youth, Sport and Culture, *ECHE monitoring guide for Erasmus+ national agencies*, Publications Office of the European Union, 2023, <https://data.europa.eu/doi/10.2766/62164>
- [9] F. Berger, N. Galati, and S. Witteler. *Making interoperability work. Challenges and Solutions for an Interoperable Higher Education System*. No. 72, 2023.