1. Characterization

1.1. Higher Education Institutions

Universidade Do Minho

1.1.a. Other Higher Education Institutions (in association) (article 41 and following of Decree-Law no. 74/2006, of March 24, as amended by Decree-Law no. 65/2018, of August 16 and added by Decree-Law no. 27/2021, of April 16).

[no answer]

1.1.b. Other Higher Education Institutions (foreign, in association) (article 41 and following articles of Decree-Law no. 74/2006, of March 24, as amended by Decree-Law no. 65/2018, of August 16 and added by Decree-Law no. 27/2021, of April 16).

[no answer]

1.1.c. Other Institutions (in cooperation) (article 41 and following of Decree-Law no. 74/2006, of March 24, in the wording given by Decree-Law no. 65/2018, of August 16 and added by Decree-Law no. 27/2021, of April 16). See article 6 of Decree-Law no. 133/2019, of September 3, when applicable).

[no answer]

1.2. Organic Units

Escola De Engenharia (UM)

1.2.a. Identification of the organic unit(s) of the partner entity(ies) (college, school, institute, etc.)

[no answer]

1.3. Study programme (PT):

Análise Estrutural de Monumentos e Construções Históricas

1.3. Study programme (EN):

Structural Analysis of Monuments and Historical Construction

1.4. Degree (PT):

Mestre

1.4. Degree (EN):

Master

10.5. Publication of the study plan in ?Diário da República?

2015 SAHC Diario da Republica.PDF | *PDF* | *216 Kb*

1.6. Main scientific area of the study programme. (PT)

Ciências de Engenharia Civil

1.6. Main scientific area of the study programme. (EN)

Civil Engineering Sciences

1.7.1. CNAEF classification - first core area

1.7.2. CNAEF classification - second fundamental area, if applicable

[no answer]

1.7.3. CNAEF classification - third core area, if applicable

[no answer]

1.8. Number of ECTS credits necessary to obtain the degree

60.0

1.9. Duration of the study programme

1 year

1.10.1. Current maximum number of admissions.

50

1.10.2. Maximum number of admissions proposed (when different from the current number) and justification.

n.a.

1.11. Specific enrolment requirements. (PT)

a) titulares do grau de licenciado ou equivalente em Engenharia Civil ou áreas afins (mínimo de 240 ECTS ou 4 anos de formação);
b) titulares de um grau académico superior estrangeiro, nas áreas descritas em a), conferido na sequência de um ciclo de estudos (mín. 240 ECTS ou 4 anos de formação), organizado de acordo com os princípios de Bolonha por um Estado aderente;
c) titulares de um grau académico superior estrangeiro, nas áreas descritas em a), reconhecido pelo Conselho Científico da Escola de Engenharia como satisfazendo os objetivos do grau de licenciado (min. quatro anos de formação);
d) detentores de um currículo escolar, científico ou profissional, nas áreas descritas em a), reconhecido pelo Conselho Científico da Escola de Engenharia.
e) Domínio da língua Inglesa para estudantes não oriundos de países de língua inglesa:
- Certificado TOEFL baseado em papel (mínimo 525)
- Certificado TOEFL eletrónico (mínimo 72)
- Outro certificado reconhecido de proficiência linguística

1.11. Specific enrolment requirements. (EN)

a) Holders of a bachelor's degree or equivalent in Civil Engineering or related areas (minimum of 240 ECTS or 4 years of training);
b) Holders of a foreign higher academic degree, in the areas described in a), awarded following a first cycle of studies (minimum of 240 ECTS or 4 years of training), organised in accordance with the Bologna principles by a adhering State;
c) Holders of a foreign higher academic degree, in the areas described in a), recognised by the Scientific Council of the School of Engineering as satisfying the objectives of the degree with at least four years of training;
d) Holders of an academic, scientific, or professional curriculum, in the areas described in a), recognised by the Scientific Council of the School of Engineering.
e) Proficiency in English. Students not from English-speaking countries:
- Paper-based TOEFL certificate (minimum score 525)
- Electronic TOEFL certificate (minimum score 72)
- Another recognised certificate of language proficiency

1.12. Instructional modality

[X] Face-to-face (Decree-Law no. 65/2018, from August 16th) [ ] Distance Learning (EaD) (Decree-Law no. 133/2019, from September 3)

1.12.1. Working-time regime, if face-to-face

[X] Daytime [ ] After business hours [ ] Other

1.12.1.a. If other, specify (PT)

[no answer]

1.12.1.1. If other, specify. (EN)

[no answer]

1.13. Location where the study programme will be offered (if face-to-face). (PT)

Univ. Minho
Univ. Técnica Checa de Praga
Univ. Politécnica da Catalunha
Univ. Pádua

1.13. Location where the study programme will be offered (if face-to-face). (EN)

Univ. Minho
Czech Technical University in Prague
Technical University of Catalonia
Univ. Padova

1.14. Regulation for crediting academic education and professional experience, published in ?Diário da República?

DRE RAUM Creditação.pdf | PDF | 470.5 Kb

1.15. Observations. (PT)

Este curso de Mestrado funcionou desde a sua origem e durante dez edições consecutivas (2007-2017) como um curso de Mestrado Europeu Erasmus Mundus, cofinanciado pela Comissão Europeia.
O programa é realizado numa base rotativa entre os parceiros. A parte escolar é concentrada na Universidade do Minho e a dissertação pode ser realizada em qualquer uma das instituições parceiras. Durante o 1.º semestre, o currículo decorre de forma modular e sequencial. A articulação transversal entre as UCs modulares sequenciais é assegurada pela UC "Projeto Integrado de Construções Históricas", que acompanha e integra as restantes seis UC do curso.
O plano de estudos é exatamente o mesmo, independentemente da mobilidade do estudante.

1.15. Observations. (EN)

This Master course ran since its origin and for ten consecutive years (2007-2017) as an European Erasmus Mundus Masters Course, co-funded by the European Commission.
The programme is held on a rotating basis among partners. Coursework is concentrated at the University of Minho and dissertation can be performed in any of the involved institutions. During the 1st semester, the curriculum follows a modular and sequential format. The transversal articulation between the sequential modular units is ensured by the "Integrated project of historical buildings" unit, which accompanies and integrates the other six units of the course.
The study plan is the same, no matter the student's mobility track.

2. Accreditation decision in previous assessment

2.1. A3ES reference for the previous assessment procedure.

ACEF/1718/0101502

2.2. Date of the decision.

11/04/2019

2.3. Decision of the Management Board.

Acreditar | Accredit

2.4. Accreditation period.

6 anos | 6 years

2.5. Starting date:

31/07/2018

3. Summary of improvement measures

3. Summary of improvement measures and changes to the study programme since the previous assessment. (PT)

Este curso de mestrado foi financiado pela Comissão Europeia nos primeiros 10 anos de funcionamento como Erasmus Mundus, tendo recebido 465 estudantes (14 Portugueses) de 75 países desde a sua primeira edição (ano letivo 2007/2008), e 84 alunos nas últimas 5 edições (média de 17 alunos por edição).
Após o fim do financiamento de bolsas de estudo pela Comissão Europeia e da consequente redução do número de alunos a frequentar o Mestrado, o Consórcio SAHC decidiu-se pela concentração da lecionação da parte letiva na Universidade do Minho (em lugar da sua lecionação simultânea em 2 Universidades parceiras), mas mantendo a Dissertação a funcionar nas 4 Universidades do Consórcio.
Considerando o funcionamento modular do curso (unidades curriculares lecionadas sequencialmente), a participação de 3 docentes oriundos das 3 Instituições parceiras nas aulas lecionadas na Universidade do Minho, a existência de aulas presenciais apenas durante o primeiro semestre letivo, a predominância de alunos estrangeiros, e a mobilidade dos alunos durante a Dissertação, a Direção de Curso (em colaboração com o Consórcio SAHC) aprofundou o seu processo interno de controlo da qualidade da formação académica e satisfação dos alunos. Para o efeito, são realizados inquéritos anónimos detalhados (plataforma Moodle personalizada, https://elearning.msc-sahc.org/) aos alunos no final de cada uma das 8 Unidades Curriculares (a que todos os alunos respondem) abrangendo todos as vertentes da lecionação (ex.: interesse dos tópicos, qualidade dos materiais de lecionação, qualidade dos docentes, coordenação dos tópicos e das aulas, etc.). A Direção de Curso analisa os resultados dos inquéritos de cada Unidade Curricular e atua no sentido de melhorar o funcionamento das Unidades Curriculares subsequentes (se aplicável). A equipa letiva reúne no final do ano letivo e analisa os resultados de todos os inquéritos, definindo-se ações concretas de melhoria por Unidade Curricular e para o Curso para o ano letivo seguinte.
Foram igualmente criadas mais atividades de âmbito laboratorial, onde os alunos têm a oportunidade de construir, reforçar e ensaiar à rotura provetes de alvenaria, madeira e betão armado. Foi também adquirida literatura técnica e científica recente, específica da área da engenharia da conservação e relevante para este curso de Mestrado, para a biblioteca.

3. Summary of improvement measures and changes to the study programme since the previous assessment. (EN)

This master's course was funded by the European Commission for the first 10 years of its operation as Erasmus Mundus, and received 465 students (14 Portuguese) from 75 countries since its first edition (academic year 2007/2008), and 84 students in the last 5 editions (average of 17 students per edition).
Following the end of scholarship funding from the European Commission and the consequent reduction in the number of students enrolling in the Master's, the SAHC Consortium decided to concentrate the coursework at the University of Minho (instead of hosting it simultaneously at 2 partner universities) but to keep the Dissertation running at the 4 universities in the Consortium.
Considering the modular nature of the course (curricular units taught sequentially), the participation of 3 lecturers from the 3 partner institutions in the classes taught at the University of Minho, the existence of face-to-face classes only during the first semester, the predominance of foreign students, and the mobility of students during the Dissertation, the Course Management (in collaboration with the SAHC Consortium) has deepened its internal process for monitoring the quality of academic training and student satisfaction. To this end, detailed anonymous surveys (customized Moodle platform, https://elearning.msc-sahc.org/) are carried out with students at the end of each of the 8 Curricular Units (to which all students respond) covering all aspects of teaching (e.g. interest of topics, quality of teaching materials, quality of lecturers, coordination of topics and classes, etc.). The Course Director analyses the results of the surveys for each course and acts to improve the functioning of subsequent courses (if applicable). The teaching team meets at the end of the academic year and analyses the results of all the surveys, defining concrete improvement actions for each Curricular Unit and for the Course for the following academic year.
More laboratory activities have also been created, where students can build, strengthen, and test to failure masonry, wood, and reinforced concrete specimens. Recent technical and scientific literature, specific to the field of conservation engineering and relevant to this Master's course, was also acquired for the library.

4. Curricular Development

4.1. Curriculum structure

4.1 Do the curricular structure and syllabus in force correspond to those published in the Diário da República (point 1.5)?

[X] Yes [ ] No

4.2. Will changes be made to the curriculum?

[X] Yes [ ] No

4.2.1. Summary of the proposed changes duly justified. (PT)

A anterior área científica do curso, "Ciências de Engenharia Civil", é substituída pela área científica "Engenharia Civil" por uma questão de coerência e uniformização com os restantes projetos de ensino do Departamento de Engenharia Civil.
A designação da anterior unidade curricular "Inspeção e diagnóstico" é alterada para "Inspeção e diagnóstico de construções históricas" tendo em vista uma melhor clarificação do seu teor.
A designação da anterior unidade curricular "Projeto Integrado" é alterada para "Projeto integrado de construções históricas" tendo em vista uma melhor clarificação do seu teor.
A designação da anterior unidade curricular "Projeto de Tese/Dissertação" é alterada para "Dissertação" para dar cumprimento ao Decreto-Lei n.º65/2018 (art.º 20.º).

4.2.1. Summary of the proposed changes duly justified. (EN)

The previous scientific area of the course, "Civil Engineering Sciences", is replaced by the scientific area "Civil Engineering" for the sake of coherence and standardization with the other teaching projects from the Civil Engineering Department.
The name of the previous course "Inspection and diagnosis" is changed to "Inspection and diagnosis of historical buildings" to further clarify its content.
The name of the previous curricular unit "Integrated Project" is changed to "Integrated project for historical buildings" to further clarify its content.
The name of the previous curricular unit "Thesis Project/Dissertation" is changed to "Dissertation" to comply with Decree-Law no. 65/2018 (art. 20).

Map II - General Path

4.1.1. Branches, variants, specialization areas, specialties or other forms of organization (if applicable)* (PT):

Percurso Geral

4.1.1. Branches, variants, specialization areas, specialties or other forms of organization (if applicable)* (EN):

General Path

4.1.2. Scientific areas and credits necessary for awarding the degree

Scientific Area	Acronym	Mandatory ECTS	Minimum Optional
Engenharia Civil	ECiv	60.0	
Total: 1		Total: 60.0	

4.1.3. Observations (PT)
Existe um percurso comum e único para todos os alunos .

4.1.3. Observations (EN)
There is a common and unique pathway for all students.

4.2. Curricular Units

Map III - Comportamento Sísmico e Dinâmica Estrutural

4.2.1. Title of curricular unit (PT):
Comportamento Sísmico e Dinâmica Estrutural

4.2.1. Title of curricular unit (EN):
Seismic Behaviour and Structural Dynamics

4.2.2. Acronym of the areas associated to the CU (PT):
ECiv

4.2.2. Acronym of the areas associated to the CU (EN):
CivEng

4.2.3. Duration (PT):
Semestral 1ºS

4.2.3. Duration (EN):
Semiannual 1st S

4.2.4. Total working hours:
140.0

4.2.5. Total contact hours:
On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Daniel Vitorino Castro Oliveira - 45.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
[no answer]

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
Compreender o fenómeno sísmico e as principais características dos sismos;
- Descrever a resposta dinâmica e sísmica de sistemas equivalentes a um grau de liberdade e a múltiplos graus de liberdade;
- Comparar as diferentes metodologias para a análise sísmica de estruturas;
- Aplicar os mecanismos de dano e colapso em estruturas antigas de alvenaria.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To understand the seismic phenomenon and the main characteristics of earthquakes;
- To describe the dynamic and seismic responses of structures equivalent to single and multiple degrees of freedom;
- To compare the different methodologies for the seismic analysis of structures;
- To apply the damage and collapse mechanisms in ancient masonry structures.

4.2.11. Syllabus (PT):
1. Elementos de sismologia e sismicidade;
2. Elementos de análise da perigosidade sísmica;
3. Análise dinâmica e sísmica de sistemas de um grau de liberdade;
4. Análise dinâmica e sísmica de sistemas de múltiplos graus de liberdade;
5. Análise dinâmica de estruturas usando o método dos elementos finitos;
6. Análises não lineares estáticas e dinâmicas de estruturas;
7. Dimensionamento sísmico de edifícios;
8. Dinâmica de estruturas nos regulamentos sísmicos;
9. Mecanismos de dano e colapso em edifícios existentes de alvenaria.

4.2.11. Syllabus (EN):

1. Fundamentals of seismology and seismicity;
2. Fundamentals of seismic hazard analysis;
3. Dynamic and seismic analysis of single-degree-of-freedom systems;
4. Dynamic and seismic analysis of single-degree-of-freedom systems;
5. Dynamic analysis of structures using the finite element method;
6. Nonlinear dynamic and static analyses;
7. Earthquake-resistant design of buildings;
8. Structural dynamics in building codes;
9. Damage and collapsing mechanisms in existing masonry structures.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):

Os conteúdos programáticos incluem uma abordagem à sismologia e à análise da perigosidade sísmica, seguida pela análise dinâmica e sísmica de sistemas de um e múltiplos graus de liberdade, tendo em vista a sua aplicação a problemas de engenharia. Posteriormente, introduzem-se as diversas técnicas de análise sísmica de estruturas com aplicação a casos simples. Em seguida, apresenta-se os aspetos conceptuais relacionados com o dimensionamento sísmico de estruturas e os aspetos e os aspetos regulamentares mais relevantes. Por fim, discute-se em detalhe os mecanismos de dano e colapso em edificios antigos de alvenaria.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):

The syllabus includes an approach to seismology and seismic hazard analysis, followed by the dynamic and seismic analysis of single and multiple degree-of-freedom systems, with a focus on their application to engineering problems. Subsequently, several seismic analysis techniques are introduced, with application to simple cases. Next, the aspects related to earthquake-resistant design of buildings and building codes are presented. Finally, the damage and collapsing mechanisms in ancient masonry structures are discussed in detail.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A unidade curricular decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos durante a tarde. Os trabalhos incluem: um exercício sobre aspectos sismológicos de um dado país; desenvolvimento de ferramentas numéricas simples para a análise dinâmica integrada de estruturas; análise sísmica detalhada de uma estrutura de alvenaria, recorrendo a modelos constitutivos avançados. Todos os elementos de estudo são fornecidos antes de se iniciar a unidade curricular, bem como um conjunto de questões tipo para o exame. Disponibiliza-se ainda software de análise estrutural avançada.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and works during the afternoon. The assignments include: an exercise about seismological issues of a given country; the development of simple numerical tools for the integrated dynamic analysis of structures; detailed seismic analysis of a masonry structure resorting to advanced constitutive models. All study elements are provided before starting the unit, together with a set of sample questions for the example. Advanced structural analysis software is provided to the students.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 60%) e um exame (peso na classificação de 40%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 60% of the final grade) and an exam (accounting for 40% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com o comportamento dinâmico e o desempenho sísmico, com a aplicação destes princípios à resolução de uma série de problemas práticos de grupo pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde as características dos sismos à resposta dinâmica) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This unit combines lectures presenting and discussing theoretical concepts and principles related to dynamic behaviour and seismic performance, with the application of these principles to the resolution of a series of practical group problems by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go across the different learning objectives (e.g. from earthquake characteristics to dynamic response) and assimilate them in a logical way.

4.2.16. Bibliography (PT):

Bozorgnia Y., Bertero V.V. (2004): "Earthquake Engineering: From Engineering Seismology to Performance-Based Engineering", CRC Press.
Chopra (2020): "Earthquake Dynamics of Structures: Theory and Applications to Earthquake Engineering", 5th edition in SI units, Prentice-Hall.
Kramer, S. L. (1996): "Geothecnical Earthquake Engineering", Prentice-Hall.
Tomazevic M. (1999): "Earthquake-resistant design of masonry buildings", Series on innovation in structures and construction, Imperial College Press, London.
Circ. 7/2019, Circolare n.7 del 21 gennaio 2019 Istruzioni per l'applicazione dell'«Aggiornamento delle "Norme tecniche per le costruzioni"» di cui al decreto ministeriale 17 Gennaio 2018, GU n. 35 del 11–2-2019, 2019 (in Italian).

4.2.16. Bibliography (EN):

Bozorgnia Y., Bertero V.V. (2004): "Earthquake Engineering: From Engineering Seismology to Performance-Based Engineering", CRC Press.
Chopra (2020): "Earthquake Dynamics of Structures: Theory and Applications to Earthquake Engineering", 5th edition in SI units, Prentice-Hall.
Kramer, S. L. (1996): "Geothecnical Earthquake Engineering", Prentice-Hall.
Tomazevic M. (1999): "Earthquake-resistant design of masonry buildings", Series on innovation in structures and construction, Imperial College Press, London.
Circ. 7/2019, Circolare n.7 del 21 gennaio 2019 Istruzioni per l'applicazione dell'«Aggiornamento delle "Norme tecniche per le costruzioni"» di cui al decreto ministeriale 17 Gennaio 2018, GU n. 35 del 11–2-2019, 2019 (in Italian).

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):

[no answer]

Map III - Dissertação

4.2.1. Title of curricular unit (PT):

Dissertação

4.2.1. Title of curricular unit (EN):

Dissertation

4.2.2. Acronym of the areas associated to the CU (PT):

ECiv

4.2.2. Acronym of the areas associated to the CU (EN):

CivEng

4.2.3. Duration (PT):

Semestral 2ºS

4.2.3. Duration (EN):

Semiannual 2nd S

4.2.4. Total working hours:

588.0

4.2.5. Total contact hours:

On-site (OS) - TO-15.0

4.2.6. % Remote contact hours:

0.00%

4.2.7. ECTS credits:
21.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Daniel Vitorino Castro Oliveira - 15.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
[no answer]

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Definir o plano de de trabalhos;
- Desenvolver as tarefas do plano;
- Escrever a dissertação de acordo com o trabalho realizado;
- Apresentar a dissertação.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To define the work plan;
- To carry out the tasks in the plan;
- To write the dissertation according to the work carried out;
- To present the dissertation.

4.2.11. Syllabus (PT):
O conteúdo programático da dissertação é específico para cada aluno, em função do tema atribuído. Este consiste num trabalho de investigação e num trabalho de síntese escrita da investigação.

4.2.11. Syllabus (EN):
The syllabus of the dissertation is specific to each student, depending on the assigned topic. This is a research work and involves the development of a written synthesis of the research.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):
Na unidade curricular pretende-se que o estudante pesquise sobre conceitos, modelos e instrumentos relativos ao planeamento de um trabalho de investigação, passando à posterior elaboração e defesa de uma dissertação original. O trabalho de investigação consiste na implementação das tarefas planeadas, apoiando o desenvolvimento do trabalho conducente à redação e apresentação da dissertação. Neste contexto, pretende-se que o estudante desenvolva a sua capacidade para integrar conhecimento, lidar com questões complexas, assim como a sua capacidade de compreensão e de resolução de problemas em situações novas e em contextos relacionados com a sua área de estudo, desenvolvendo soluções e reflexões sobre o tema em estudo.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):
This unit's purpose is that students develop the search for information on concepts, models and instruments relative to the planning of the research work, in order to develop and present an original dissertation work. The research is based on the implementation of the proposed tasks, supporting the development of work leading to the written document and its public discussion. In this context, it is intended that students develop their ability to integrate knowledge, and handle complex questions, as well as their ability to understand and solve problems in new situations and multidisciplinary contexts, developing solutions and reflections on the subject under study.

4.2.13. Teaching methodologies (including students' assessment) (PT):
O método de ensino consiste no desenvolvimento de trabalho individual de pesquisa, com supervisão do orientador, onde são explorados conteúdos específicos para o tema de dissertação em causa.

4.2.13. Teaching methodologies (including students' assessment) (EN):
The teaching method consists of the development of individual research work, under the guidance of the supervisor, where the specific contents of the dissertation are researched.

4.2.14. Evaluation (PT):
O método de avaliação consiste na apreciação da dissertação pelo júri da prova, tendo em conta a qualidade do documento escrito, que reflete o trabalho de investigação desenvolvido. É também tida em conta a discussão pública dividida entre a apresentação oral do trabalho e o período de discussão subsequente oral. A nota final resulta da classificação atribuída à Dissertação (60%) e à sua apresentação e discussão pública (40%).

4.2.14. Evaluation (EN):

The evaluation of the dissertation consists of its examination by the thesis committee, taking into account the intrinsic quality of the written document that reflects the research work done. It is also considered the public discussion divided between the oral presentation of the work and the subsequent discussion period. The final score is based on the score of the dissertation (60%) and public presentation and discussion (40%).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

A unidade curricular desenrola-se segundo um modelo de aprendizagem específico, em que é proposto o desenvolvimento do trabalho de pesquisa individual, sob coordenação do orientador, de modo a incentivar a exploração de conteúdos específicos para o tema de dissertação em causa. Este tipo de metodologia permite ao aluno desenvolver a sua capacidade para integrar conhecimentos, lidar com questões complexas, desenvolver soluções ou emitir juízos em situações de informação limitada ou incompleta. Por fim, o estudante deverá demonstrar capacidade para comunicar as suas conclusões, e os conhecimentos e raciocínios a elas subjacentes de forma clara e sem ambiguidades.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

The unit is based on a specific learning model, where individual research work, coordinated by the supervisor, is developed to encourage research and development on the specific content of the thesis. This learning model allows students to develop their capacity to integrate knowledge, handle complex issues, develop solutions, and make judgments in situations of limited or incomplete information. In the end, the student should demonstrate the ability to communicate his conclusions and knowledge in a clear and unambiguous way.

4.2.16. Bibliography (PT):

The search for information sources should be carried out by the student. The following transversal references are considered:
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.
Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
D'Altri, A., Sarhosis, V., Milani, G., Rots, J., Cattari, S., Lagomarsino, S., Sacco, E., Tralli, A., Castellazzi, G., de Miranda, S., Modeling strategies for the computational analysis of unreinforced masonry structures: Review and classification, Archives of Computational Methods in Engineering, 27, 1153–1185, 2020.

4.2.16. Bibliography (EN):

The search for information sources should be carried out by the student. The following transversal references are considered:
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.
Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
D'Altri, A., Sarhosis, V., Milani, G., Rots, J., Cattari, S., Lagomarsino, S., Sacco, E., Tralli, A., Castellazzi, G., de Miranda, S., Modeling strategies for the computational analysis of unreinforced masonry structures: Review and classification, Archives of Computational Methods in Engineering, 27, 1153–1185, 2020.

4.2.17. Observations (PT):

O programa é realizado numa base rotativa entre os parceiros. A parte escolar (setembro - março) é concentrada na Universidade do Minho e a dissertação (abril - julho) pode ser realizada em qualquer uma das instituições parceiras. O currículo é exatamente o mesmo, independentemente da mobilidade do estudante. Em particular, a unidade curricular "Dissertação" está registada e acreditada com 21 ECTS em todas as quatro Universidades parceiras.
Assim, a unidade curricular Dissertação decorre em todas as a instituições parceiras e tem por objetivo desenvolver competências profissionais e/ou de investigação no domínio da conservação de estruturas do património arquitetónico.
Qualquer docente do ciclo de estudos pode orientar o estudante.

4.2.17. Observations (EN):
The programme is held on a rotating basis among partners. Coursework (September – March) is concentrated at the University of Minho and dissertation work (April – July) can be performed in any of the involved institutions. The curriculum is exactly the same, no matter the student's mobility track. In particular, the "Dissertation" curricular unit is registered and accredited with 21 ECTS at all four partner universities.
Therefore, the Dissertation curricular unit takes place at all partner institutions and aims at developing research and/or professional competencies in the field of conservation of architectural heritage structures.
Any lecturer of the study cycle can supervise the student.

Map III - História da Construção e da Conservação

4.2.1. Title of curricular unit (PT):
História da Construção e da Conservação

4.2.1. Title of curricular unit (EN):
History of Construction and of Conservation

4.2.2. Acronym of the areas associated to the CU (PT):
ECiv

4.2.2. Acronym of the areas associated to the CU (EN):
CivEng

4.2.3. Duration (PT):
Semestral 1ºS

4.2.3. Duration (EN):
Semiannual 1st S

4.2.4. Total working hours:
140.0

4.2.5. Total contact hours:
On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Paulo José Brandão Barbosa Lourenço - 30.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
• Luca Pelà - 15.0h

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Identificar os materiais e técnicas de construção.
- Interpretar os principais elementos estruturais (fundações, paredes, colunas, arcos e abóbadas, pavimentos e coberturas).
- Ilustrar a história da conservação.
- Justificar a metodologia geral para a análise estrutural.
- Descrever o dano principal em monumentos e mecanismos de colapso.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):

- To identify construction materials and techniques.
- To interpret the main structural elements (foundations, walls, columns, arches and vaults, pavements and roofs).
- To illustrate the history of conservation.
- To justify the general methodology for structural analysis.
- To describe the principal damage in monuments and collapse mechanisms.

4.2.11. Syllabus (PT):

1. Introdução. Conceitos gerais. Abordagem moderna ao estudo e conservação de estruturas patrimoniais. Documentos internacionais.
2. Tecnologias de construção e componentes estruturais: (1) Alvenaria e terra: (2) Madeira; (3) Metais; (4) Betão e materiais modernos.
3. Sistemas estruturais. Construção de grandes abóbadas e cúpulas. Evolução da construção histórica em alvenaria.
4. Mecanismos de dano e colapso em construções históricas: (1) Gravidade a assentamentos do terreno; (2) Ações ambientais e antropogénicas; (3) Sismos.
5. Regras antigas e abordagens clássicas. Linhas de equilíbrio e análise limite.
6. Análise limite: (1) abordagem estática; (2) Abordagem cinemática. Exemplos detalhados de aplicação a arcos, torres e fachadas.
7. História da conservação e restauro. Critérios modernos de conservação e aspetos práticos.
8. Casos de estudo.

4.2.11. Syllabus (EN):

1. Introduction. General concepts. Modern approach to the study and conservation of heritage structures. International documents.
2. Construction technologies and structural components: (1) Masonry and earth; (2) Timber; (3) Metals; (4) Concrete and modern materials.
3. Overall Structural Arrangements. Construction of large vaults and domes. Evolution of historical masonry construction
4. Damage and collapsing mechanisms in historical structures: (1) Gravity and soil settlements; (2) Environmental and anthropogenic actions; (3) Earthquakes.
5. Ancient rules and classical approaches. From equilibrium lines to limit analysis.
6. Limit analysis: (1) static approach; (2) kinematic approach. Detailed examples of application to arches, towers and wall façades.
7. History of conservation and restoration. Modern conservation criteria and practical issues.
8. Case studies.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):

Os conteúdos programáticos incluem o estudo dos diferentes sistemas estruturais (por exemplo construção do tipo coluna-lintel, arcos, abóbadas e cúpulas, coberturas e pavimentos em madeira, sistemas porticados, estruturas laminares, estruturas tensionadas, etc.). A apresentação e discussão de um catálogo de dano permitem conhecer danos típicos e interpretar as observações e levantamentos efetuados. Apresenta-se depois uma evolução dos métodos de análise estrutural, com relevo para a análise limite (método estático e cinemático) e com aplicações dos mesmos, tendo em vista melhor compreender o comportamento de estruturas de alvenaria. Esta atividade é complementada pela história da conservação e restauro, bem como as cartas mais recentes, para permitir avaliar e propor intervenções adequadas. Finalmente discutem-se detalhadamente casos de estudo representativos de construções de valor patrimonial.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):

The syllabus includes the study of the different structural systems (such as post-and-lintel construction, arches, vaults and cupolas, roof and timber floors, framed systems, laminar structures, tensioned structures, etc.). Only with the knowledge of different typologies it is possible to identify structural systems in an existing building. The presentation and discussion of a damage catalogue allow for knowing the typical damage and interpret the observations and surveys carried out. Then, the evolution of structural analysis methods is presented, with a focus on limit analysis (static and kinematic methods) and their applications, so that the behaviour of masonry structures is understood. This activity is complemented by the history of conservation and restoration, as well as the more recent charts, to evaluate and propose adequate interventions. Finally, case studies representative of architectural heritage are discussed in detail.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A UC decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos (individuais e de grupo) durante a tarde, com visitas a caso de estudo. Os trabalhos incluem: um relatório de grupo com o resultado da pesquisa sobre materiais, componentes e sistemas de uma tipologia e contexto cultural específicos, com comparação entre diferentes localizações geográficas; um exercício em grupo de identificação de dano e suas causas com uma visita de estudo, que inclui breve descrição do edifício, mapeamento das anomalias e definição das possíveis causas de dano; a resolução individual de problemas de análise limite. Todos os elementos de estudo são fornecidos antes de se iniciar a UC, bem como um conjunto de questões tipo para o exame.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and works during the afternoon (individual or in a group). The assignments include: a group report with the result of research about materials, components, and systems of a given typology and cultural context, with a comparison between different geographical locations: a group exercise with damage identification and its causes of a real case study, including a brief description of the building, damage mapping and the definition of possible damage causes; the individual solution of limit analysis problems. All study elements are provided before starting the unit, together with a set of sample questions for the example.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 50%) e um exame (peso na classificação de 50%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 50% of the final grade) and an exam (accounting for 50% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com a evolução da construção e da conservação das edificações, com a aplicação destes princípios à resolução de uma série de problemas práticos, individuais e de grupo, pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde os materiais aos mecanismos de colapso) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This unit combines lectures presenting and discussing theoretical concepts and principles related to the evolution of construction and conservation of buildings, with the application of these principles to the resolution of a series of individual and group practical problems by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go through the different learning objectives (e.g. from materials to collapse mechanisms) and assimilate them in a logical way.

4.2.16. Bibliography (PT):

Croci, G. (1998) The Conservation and Structural Restoration of Architectural Heritage. WIT Press, Southampton
Feilden, B., M. (2003) Conservation of Historic Buildings. Elsevier Science and Technology
International Charter for the Conservation and Restoration of Monuments and Sites (the Venice Charter), 1964.
ISCARSAH 2001. Recommendations for the Analysis and Restoration of Historical Structures, ICOMOS, 2001.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.

4.2.16. Bibliography (EN):

Croci, G. (1998) The Conservation and Structural Restoration of Architectural Heritage. WIT Press, Southampton
Feilden, B., M. (2003) Conservation of Historic Buildings. Elsevier Science and Technology
International Charter for the Conservation and Restoration of Monuments and Sites (the Venice Charter), 1964.
ISCARSAH 2001. Recommendations for the Analysis and Restoration of Historical Structures, ICOMOS, 2001.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):

[no answer]

Map III - Inspeção e Diagnóstico de Construções Históricas

4.2.1. Title of curricular unit (PT):

Inspeção e Diagnóstico de Construções Históricas

4.2.1. Title of curricular unit (EN):
Inspection and Diagnosis of Historical Buildings

4.2.2. Acronym of the areas associated to the CU (PT):
ECiv

4.2.2. Acronym of the areas associated to the CU (EN):
CivEng

4.2.3. Duration (PT):
Semestral 1ºS

4.2.3. Duration (EN):
Semiannual 1st S

4.2.4. Total working hours:
140.0

4.2.5. Total contact hours:
On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Nuno Adriano Leite Mendes - 15.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
• Jorge Manuel Gonçalves Branco - 15.0h
• Maria Isabel Brito Valente - 15.0h

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Descrever as técnicas de inspeção e diagnóstico estrutural aplicável às construções históricas.
- Explicar os princípios dos ensaios e métodos de inspeção e diagnóstico.
- Realizar trabalhos de inspeção estrutural.
- Usar os resultados de trabalhos de inspeção e diagnóstico para a análise de estruturas.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To describe the methods for inspection and diagnosis applicable to historic structures.
- To explain the working principles of the methods and tests for inspection and diagnosis.
- To elaborate on inspection and diagnosis works.
- To use the results from the inspection and diagnosis works for structural analysis.

4.2.11. Syllabus (PT):
1. Metodologia geral para a inspeção e diagnóstico.
2. Documentação sobre construções históricas, possíveis danos estruturais e inspeções visuais.
3. Investigação e monitorização de solos e rochas.
4. Inspeção in situ sobre estruturas de madeira, aço e betão armado.
5. Ensaios in situ não destrutivos e ligeiramente destrutivos para estruturas de alvenaria.
6. Complementaridade entre ensaios não destrutivos e ligeiramente destrutivos. Casos de estudo.
7. Ensaios de laboratório e ensaios de carga.
8. Monitorização de estruturas históricas.
9. Análise de dados monitorização e remoção de efeitos cíclicos.
10. Ensaios de identificação modal de estruturas históricas.
11. Ajuste de modelos estruturais.

4.2.11. Syllabus (EN):

1. General methodology for inspection and diagnosis.
2. Documentation of historic structures, typical damage and visual inspections.
3. Soils and rocks in situ investigation and monitoring.
4. In situ investigation of timber, steel and concrete structures.
5. In situ NDT and MDT for masonry structures.
6. Complementarily of NDT and MDT and case studies presentation.
7. Laboratory load tests and in situ load tests.
8. Monitoring of historic structures.
9. Monitoring analysis and cyclic effects.
10. Modal testing of historic structures.
11. Structural assessment.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):

Na unidade curricular pretende-se transmitir ao estudante um conjunto de conceitos, métodos e ferramentas de análise relacionadas com a inspecção e diagnóstico estrutural, no contexto da conservação de monumentos e construções antigas. O programa apresenta estes conceitos, métodos e ferramentas de forma teórico e através de concretizações práticas, com recurso frequentes cados de estudo e de exercícios académicos, levando a uma melhor compreensão das técnicas de inspecção e diagnóstico estrutural.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):

The main objectives of the course are the understanding by the students of the main concepts, methods, and tools concerning the inspection and diagnosis of historical constructions, and their use for heritage constructions. The syllabus presents these main concepts, methods, and tools with a practical view, where case studies and exercises are presented to the student on a frequent basis, allowing a better understanding the best inspection and diagnosis practices.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A UC decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos (individuais e de grupo) durante a tarde, com visitas a caso de estudo. Os trabalhos incluem: uma inspeção a uma estrutura histórica com danos estruturais; utilização de equipamento de ensaio não destrutivo e interpretação de resultados; análise de dados de um sistema de monitorização; ensaios de identificação modal de uma estrutura. Todos os elementos de estudo são fornecidos antes de se iniciar a UC, bem como um conjunto de questões tipo para o exame. Disponibiliza-se ainda software de análise para alguns métodos de inspeção.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and works during the afternoon (individual or in a group). The assignments include: the visual inspection of a historic construction; exercises with NDT methods; analysis of monitoring data; modal identification analysis. All study elements are provided before starting the unit, together with a set of sample questions for the example. Analysis software is provided to the students.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 50%) e um exame (peso na classificação de 50%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 50% of the final grade) and an exam (accounting for 50% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com a inspeção e o diagnóstico de estruturas, com a aplicação destes princípios à resolução de uma série de problemas práticos, individuais e de grupo, pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde as técnicas de inspeção aos métodos de ensaio) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This unit combines lectures on the presentation and discussion of theoretical concepts and principles related to the inspection and diagnosis of structures with the application of these principles to the resolution of a series of individual and group practical problems by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go through the different learning objectives (e.g. from inspection techniques to testing methods) and assimilate them in a logical way.

4.2.16. Bibliography (PT):

Committee on Analysis and Restoration of Structures of Architectural Heritage, ICOMOS; Investigation procedures for the diagnosis of historic masonries, Construction and Building Materials, 14, 2000.
HeritageCare, General methodology for the preventive conservation of cultural heritage buildings, Report of the Project Activity 1.3, 2017.
Bedford, J., Photogrammetric applications for cultural heritage: Guidance for good practice, Historic England, 2017.
Ippolito, A., Cigola, M., Handbook of research on emerging technologies for digital preservation and information modeling, 2016.
Kushwaha, S.K.P., Dayal, K.R., Sachchidanand, Raghavendra, S., Pande, H., Tiwari, P.S., Agrawal, S., Srivastava, S.K., 3D digital documentation of a cultural heritage site using terrestrial laser scanner - A case study, Lecture Notes in Civil Engineering, 33, 49-58, 2020.

4.2.16. Bibliography (EN):

Committee on Analysis and Restoration of Structures of Architectural Heritage, ICOMOS; Investigation procedures for the diagnosis of historic masonries, Construction and Building Materials, 14, 2000.
HeritageCare, General methodology for the preventive conservation of cultural heritage buildings, Report of the Project Activity 1.3, 2017.
Bedford, J., Photogrammetric applications for cultural heritage: Guidance for good practice, Historic England, 2017.
Ippolito, A., Cigola, M., Handbook of research on emerging technologies for digital preservation and information modeling, 2016.
Kushwaha, S.K.P., Dayal, K.R., Sachchidanand, Raghavendra, S., Pande, H., Tiwari, P.S., Agrawal, S., Srivastava, S.K., 3D digital documentation of a cultural heritage site using terrestrial laser scanner - A case study, Lecture Notes in Civil Engineering, 33, 49-58, 2020.

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):

[no answer]

Map III - Projeto integrado de Construções Históricas

4.2.1. Title of curricular unit (PT):

Projeto integrado de Construções Históricas

4.2.1. Title of curricular unit (EN):

Integrated Project of Historical Buildings

4.2.2. Acronym of the areas associated to the CU (PT):

ECiv

4.2.2. Acronym of the areas associated to the CU (EN):

CivEng

4.2.3. Duration (PT):

Semestral 2ºS

4.2.3. Duration (EN):

Semiannual 2nd S

4.2.4. Total working hours:

252.0

4.2.5. Total contact hours:

On-site (OS) - S-20.0; TO-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
9.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Graça Fátima Moreira Vasconcelos - 35.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
[no answer]

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Realizar o levantamento histórico do caso de estudo;
- Mapear os danos materiais e estruturais do caso de estudo;
- Executar os ensaios não destrutivos mais adequados ao caso de estudo;
- Modelar a construção objeto de análise;
- Realizar o projeto de intervenção considerando as suas várias componentes.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To carry out a historical survey of the case study;
- To map the material and structural damage of the case study;
- To carry out the most appropriate non-destructive tests for the case study;
- To model the building being analysed;
- To carry out the intervention project considering its various components.

4.2.11. Syllabus (PT):
Os conteúdos programáticos são baseados no projeto integrado selecionado e supervisionado por um docente e abrangem a metodologia de conservação de construções históricas desde: (1) inspeção e diagnóstico; (2) avaliação da segurança estrutural; (3) proposta de um projeto de reforço.

4.2.11. Syllabus (EN):
The syllabus is based mainly on the integrated project selected and supervised and encompasses the methodology of conservation of historical constructions: (1) inspection and diagnosis; (2) assessment of the structural safety; (3) proposal of a strengthening project.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):
Nesta unidade curricular o estudante tem contato com um caso de estudo real e a oportunidade de aplicação dos conhecimentos adquiridos ao longo do curso através da realização de um projeto de intervenção de uma construção histórica.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):
Within this unit, the student is exposed to a real case study and has the opportunity to apply the knowledge acquired in the course through the integrated project for the intervention of a historical construction.

4.2.13. Teaching methodologies (including students' assessment) (PT):
Esta unidade curricular é composta por três partes principais, como se indica: (a) Visitas de estudo com apresentação de casos práticos; (b) Seminários sobre temas de conservação não abordados no curso; (c) Análise exaustiva de casos práticos em grupos de 3 a 5 alunos. No âmbito do último e mais importante item acima referido, os alunos têm de desenvolver os planos de levantamento, inspeção, diagnóstico, análise de estabilidade, projeto de conceção, estimativa de custos, monitorização e manutenção de um caso de estudo real representativo.
O método de ensino consiste no desenvolvimento de trabalho de pesquisa e de trabalho aplicado na realização do projeto integrado com supervisão de um docente. Os alunos desenvolvem trabalho de grupo de inspeção e disgnóstico de estruturas, utilização de ferramentas de análise estrutural e dimensionamento de técnicas de reforço.

4.2.13. Teaching methodologies (including students' assessment) (EN):

This unit is composed of three main parts, as follows: (a) Field trips with presentations on case studies; (b) Seminars on conservation subjects not addressed in the course; (c) Comprehensive analysis of case studies in groups of 3 to 5 students. Within the last and most important item, students have to develop the survey, inspection, diagnosis, stability analysis, design project, cost estimation, monitoring, and maintenance plans of a representative real case study.
The teaching method consists of the development of research and practical work, under the guidance of the lecturers, in the realization of the integrated project. The students develop group work of inspection and diagnosis of structures, use of advanced numerical tools, and design of strengthening solutions for the historic constructions.

4.2.14. Evaluation (PT):

A avaliação consiste na análise de apresentações e discussões orais periódicas (30% a 40% da nota final) e no relatório final escrito (60% a 70% da nota final).

4.2.14. Evaluation (EN):

The evaluation consists of the analysis of periodic oral presentations (30% to 40% of the final grade) and the final written report (60% to 70% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

A unidade curricular desenrola-se segundo um modelo de aprendizagem específico, em que é proposto o desenvolvimento de uma projeto integrado num caso de estudo de modo a treinar os alunos para a aplicação da metodologia de conservação em casos reais. Este tipo de metodologia permite ao aluno desenvolver a sua capacidade para interligar e aplicar conhecimentos e permite treinar a aplicação prática dos conhecimentos e procura de soluções.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

The unit is based on a specific learning model, where the development of an integrated project of a historic construction is developed to train the application of the general methodology of conservation in a real case. This learning model allows students to develop their capacity to interrelate knowledge and seek practical solutions applied in real case studies.

4.2.16. Bibliography (PT):

Como referências transversais, indica-se:
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.
Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
Chopra, A., Earthquake dynamics of structures: Theory and applications to earthquake engineering, 5th edition in SI units, Prentice-Hall, 2020.
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
Penelis, G.G., Penelis, G.G., Structural restoration of masonry monuments: Arches, domes and walls, CRC Press, 2020

4.2.16. Bibliography (EN):

The following transversal references are considered:
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Roca, P., Lourenço, P.B., Gaetani, A., Historic Construction and Conservation: Materials, Systems and Damage, 1st Edition, Routledge, 2020.
Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
Chopra, A., Earthquake dynamics of structures: Theory and applications to earthquake engineering, 5th edition in SI units, Prentice-Hall, 2020.
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
Penelis, G.G., Penelis, G.G., Structural restoration of masonry monuments: Arches, domes and walls, CRC Press, 2020

4.2.17. Observations (PT):

A pesquisa de informação e bibliografia relevante para o desenvolvimento dos trabalhos deverá ser desenvolvida pelo aluno sob supervisão dos docentes, uma vez que variará de acordo com a natureza do projeto a desenvolver.
Qualquer docente do ciclo de estudos pode orientar o estudante.

4.2.17. Observations (EN):

The search for information sources and relevant literature for the development of the works should be carried out by the student under the supervision of the lecturers, as it will vary according to the nature of project to be developed.
Any lecturer of the study cycle can supervise the student.

Map III - Restauro e Conservação de Materiais

4.2.1. Title of curricular unit (PT):
Restauro e Conservação de Materiais

4.2.1. Title of curricular unit (EN):
Restoration and Conservation of Materials

4.2.2. Acronym of the areas associated to the CU (PT):
ECiv

4.2.2. Acronym of the areas associated to the CU (EN):
CivEng

4.2.3. Duration (PT):
Semestral 1ºS

4.2.3. Duration (EN):
Semiannual 1st S

4.2.4. Total working hours:
140.0

4.2.5. Total contact hours:
On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Graça Fátima Moreira Vasconcelos - 45.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
[no answer]

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Identificar as principais técnicas de caracterização laboratorial de materiais.
- Descrever os principais agentes de degradação de materiais históricos: acções físicas, químicas e mecânicas.
- Descrever as principais técnicas de reparação e restauro de materiais: pedra, tijolos, madeira, metais e alvenaria.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To identify the main laboratorial techniques for the characterization of materials.
- To describe the main agents for chemical, physical, and biological degradation of materials.
- To describe the main repair and restoration of historical materials: stone, bricks, wood, metals and masonry.

4.2.11. Syllabus (PT):

1. Materiais históricos: Tipos e classificação.
2. Identificação de Materiais históricos. Métodos laboratoriais para identificação de materiais.
3. Degradação de materiais históricos: Ações químicas e biológicas.
4. Degradação de materiais históricos: Ações químicas físicas.
5. Argamassas e materiais aglomerantes.
6. Deterioração e conservação de metais.
7. Deterioração e conservação do património construído de betão e materiais modernos do séc. 20.
8. Sais em pedra e alvenaria. Limpeza de fachadas.
9. Técnicas e materiais de reparação.
10. Consolidação de tijolos e alvenaria degradadas.
11. Conservação de materiais: consolidação de argamassas e rebocos deteriorados.
12. Restauro e conservação de madeira.

4.2.11. Syllabus (EN):

1. Historical materials: Types and Classification.
2. Identification of historic materials. Laboratory analyses of historic materials. Identification laboratory methods for material analysis
3. Degradation of historic materials: Chemical and biological actions.
4. Degradation of historic materials: Physical actions.
5. Binders and mortars.
6. Deterioration and conservation of metals.
7. Deterioration and conservation of 20th c. heritage concrete and modern materials.
8. Salts in stone and masonry and cleaning of façades.
9. Repair materials and techniques.
10. Consolidation of degraded brick and masonries.
11. Conservation of materials: Consolidation of degraded mortar and plaster and interaction with fixed artistic heritage.
12. Restoration and conservation of wood.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):

Os conteúdos programáticos incluem uma descrição dos materiais históricos e da metodologia experimental de caracterização, nomeadamente métodos avançados de caracterização experimental. Faz-se uma descrição detalhada dos processos de deterioração de materiais históricos (tijolos, pedra, madeira, metais e alvenaria) e de materiais do século 20 (betão e materiais compósitos). Adicionalmente, são introduzidas as principais técnicas de restauro e conservação de materiais históricos. São ainda apresentados diferentes casos de estudo que estabelecem a ligação entre o conhecimento teórico e a prática da conservação e restauro.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):

The syllabus includes a description of historic materials and the methodology for experimental characterization, namely the description of advanced techniques for experimental characterization. A detailed description of the main agents of deterioration of historic materials (bricks, stone, wood, masonry) and of modern 20th century materials like (concrete and composites) is given. Additionally, the main repair and conservation techniques of historic materials are introduced. Different case studies are also presented making the connection between theoretical knowledge and practical application of conservation and restoration of concepts.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A UC decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos (individuais e de grupo) e visitas ao laboratório durante a tarde, com visitas a casos de estudo. Os trabalhos incluem relatórios sobre pesquisa bibliográfica sobre os assuntos introduzidos na aula teórica e de trabalho experimental realizado em laboratório. Todos os elementos de estudo são fornecidos antes de se iniciar a UC, bem como um conjunto de questões tipo para o exame.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and work during the afternoon (individual or in a group), laboratory work, and visits to case studies. The assignments include reports based on bibliographic research and based on laboratory work. All study elements are provided before starting the unit, together with a set of sample questions for the example.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 40%) e um exame (peso na classificação de 60%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 40% of the final grade) and an exam (accounting for 60% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com o restauro e conservação de materiais e estruturas, com a aplicação destes princípios à resolução de uma série de problemas práticos de grupo pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde a deterioração à conservação de materiais) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This unit combines lectures presenting and discussing theoretical concepts and principles related to the restoration and conservation of materials and structures, with the application of these principles to the resolution of a series of practical group problems by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go through the different learning objectives (e.g. from deterioration to conservation of materials) and assimilate them in a logical way.

4.2.16. Bibliography (PT):

Riggio, M., Sandak, J., & Franke, S., Application of imaging techniques for detection of defects, damage and decay in timber structures on-site. Construction and Building Materials, 101, 1241-1252, 2015.
Newsom, S., Gibbons, P., Brown, S. "External Lime Coatings on Traditional Buildings, Historic Scotland", TAN 15, 2001.
Torney, C., Forster, A. M., Banfill, P. F., & Szadurski, E. M., The effects of site practice on the physical properties of proprietary stone restoration mortar. Construction and Building Materials, 75, 359-367, 2015.
Torraca, G., Porous Materials Building, Material science for architectural conservation, ICCROM, third edition, 1988.
Hosseini, M., Karapanagiotis, I., Advances materials for the conservation of stone, Springer, 2018.

4.2.16. Bibliography (EN):

Riggio, M., Sandak, J., & Franke, S., Application of imaging techniques for detection of defects, damage and decay in timber structures on-site. Construction and Building Materials, 101, 1241-1252, 2015.
Newsom, S., Gibbons, P., Brown, S. "External Lime Coatings on Traditional Buildings, Historic Scotland", TAN 15, 2001.
Torney, C., Forster, A. M., Banfill, P. F., & Szadurski, E. M., The effects of site practice on the physical properties of proprietary stone restoration mortar. Construction and Building Materials, 75, 359-367, 2015.
Torraca, G., Porous Materials Building, Material science for architectural conservation, ICCROM, third edition, 1988.
Hosseini, M., Karapanagiotis, I., Advances materials for the conservation of stone, Springer, 2018.

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):

[no answer]

Map III - Técnicas de Análise Estrutural

4.2.1. Title of curricular unit (PT):

Técnicas de Análise Estrutural

4.2.1. Title of curricular unit (EN):

Structural Analysis Techniques

4.2.2. Acronym of the areas associated to the CU (PT):

ECiv

4.2.2. Acronym of the areas associated to the CU (EN):

CivEng

4.2.3. Duration (PT):

Semestral 1ºS

4.2.3. Duration (EN):
Semiannual 1st S

4.2.4. Total working hours:
140.0

4.2.5. Total contact hours:
On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:
0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• Paulo José Brandão Barbosa Lourenço - 24.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
• Petr Kabele - 21.0h

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Identificar os materiais e técnicas de construção.
- Explicar os princípios da análise por elementos finitos.
- Aplicar modelos avançados de caracterização material (contínuos e descontínuos).
- Interpretar a análise não-linear de estruturas.

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To Identify construction materials and techniques.
- To explain the principles of finite element analysis.
- To apply advanced material models (continuum and discontinuum).
- To interpret non-linear structural analysis.

4.2.11. Syllabus (PT):
1.Objetivos, desafios e dificuldades na modelação e análise de estruturas históricas.
2. Revisão: Equações que governam a mecânica dos sólidos e das estruturas.
3. Princípios do método dos elementos finitos (FEM). Exemplos e detalhes para o elemento de viga Hermitiano e para o elemento plano contínuo isoparamétrico. Convergência. Solução do sistema de equações. Aspetos práticos da análise linear por elementos finitos.
4. Análise não-linear geométrica de estruturas de barra (grandes deslocamentos), análise de estabilidade para colunas esbeltas.
5. Procedimentos de solução para análise não-linear incremental por elementos finitos.
6. Modelos constitutivos elasto-plásticos. Aspetos básicos e algorítmicos. Referência a outros tipos de modelos constitutivos.
7. Comportamento da alvenaria. Técnicas de modelação, volume representativo de volume e homogeneização. Análise limite com blocos rígidos.
8. Aspetos práticos da análise não-linear por elementos finitos.

4.2.11. Syllabus (EN):
1. Aims, challenges and difficulties in the modeling and analysis of historical structures.
2. Review: governing equations of solid and structural mechanics.
3. Principle of the finite element method (FEM). Examples and details on Hermitian beam element and isoparametric 2-D continuum element. Convergence. Solution of equation systems. Practical aspects of linear finite element analysis.
4. Geometrical nonlinearity of truss structures (large displacements), stability analysis of slender columns.
5. Solution procedures for non-linear incremental FE analysis.
6. Elasto-plastic constitutive models. Basics and algorithmic aspects. Reference to other material models.
7. Masonry behavior. Modeling techniques, representative volume element, and homogenization. Blocky limit analysis.
8. Practical aspects of non-linear finite element analysis.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):

Os conteúdos programáticos incluem uma revisão das equações que governam a mecânica dos sólidos e das estruturas, seguida de uma introdução ao método dos elementos finitos, tendo em vista a sua aplicação a problemas de engenharia. Posteriormente introduzem-se os conceitos de análise não-linear geométrica, com o estudo de estruturas de barras e colunas delgadas. Para solução deste problema, introduz-se o método de Newton-Raphson e variantes. Em seguida, apresenta-se a não-linearidade material, com diferentes modelos constitutivos. Discute-se em detalhe o comportamento de estruturas de alvenaria e a aplicação prática das ferramentas avançadas.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):

The syllabus includes a review of the governing equations of solid and structural mechanics, followed by an introduction to the finite element method, with a focus on its application to engineering problems. Subsequently, the concepts of non-linear geometric analysis are introduced, with the study of truss structures and slender columns. For the solution of this problem, the Newton-Raphson method and its variants are introduced. Next, non-linear material behavior is presented, with different material models. Finally, the behavior of masonry structures and the practical application of the advanced tools are discussed in detail.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A UC decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos (individuais e de grupo) durante a tarde, com visitas a caso de estudo. Os trabalhos incluem: um exercício de solução de um problema de vigas com recurso a uma formulação analítica e ao método dos elementos finitos (FEM); análise linear em grupo de uma estrutura pelo FEM; a resolução individual de problemas sobre sistemas não-lineares e elastoplasticidade; a análise não-linear em grupo da estrutura anteriormente analisada. Todos os elementos de estudo são fornecidos antes de se iniciar a UC, bem como um conjunto de questões tipo para o exame. Disponibiliza-se ainda software de análise estrutural avançada e de análise limite.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and works during the afternoon (individual or in a group). The assignments include: the individual solution of a beam problem using the analytical formulation and the finite element method (FEM); a group linear elastic analysis of a given structure by FEM; the individual solution of non-linear systems and elastoplasticity problems; a group non-linear elastic analysis of the structure previously analyzed. All study elements are provided before starting the unit, together with a set of sample questions for the example. Advanced structural analysis and limit analysis software is provided to the students.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 50%) e um exame (peso na classificação de 50%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 50% of the final grade) and an exam (accounting for 50% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com as diversas técnicas de modelação e análise não linear, com a aplicação destes princípios à resolução de uma série de problemas práticos, individuais e de grupo, pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde a análise por elementos finitos aos resultados de modelos não lineares) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This unit combines lectures presenting and discussing theoretical concepts and principles, related to the various modelling techniques and non-linear analysis, with the application of these principles to the resolution of a series of individual and group practical problems by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go through the different learning objectives (e.g. from finite element analysis to non-linear modelling results) and assimilate them in a coherent way.

4.2.16. Bibliography (PT):

Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
Lourenço, P.B., Computational strategies for masonry structures. PhD Thesis, Delft University Press, Netherlands, 1996
Zienkiewicz, O.C., Taylor, R.L., The finite element method, Elsevier, 2006
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
D'Altri, A., Sarhosis, V., Milani, G., Rots, J., Cattari, S., Lagomarsino, S., Sacco, E., Tralli, A., Castellazzi, G., de Miranda, S., Modeling strategies for the computational analysis of unreinforced masonry structures: Review and classification, Archives of Computational Methods in Engineering, 27, 1153–1185, 2020.

4.2.16. Bibliography (EN):

Lourenço, P.B., Gaetani, A., Finite Element Analysis for Building Assessment: Advanced Use and Practical Recommendations, 1st Edition, Routledge, 2022.
Lourenço, P.B., Computational strategies for masonry structures. PhD Thesis, Delft University Press, Netherlands, 1996
Zienkiewicz, O.C., Taylor, R.L., The finite element method, Elsevier, 2006
DIANA - Finite Element Analysis, DIsplacement method ANAlyzer, DIANA FEA BV, Delft, The Netherlands, 2020.
D'Altri, A., Sarhosis, V., Milani, G., Rots, J., Cattari, S., Lagomarsino, S., Sacco, E., Tralli, A., Castellazzi, G., de Miranda, S., Modeling strategies for the computational analysis of unreinforced masonry structures: Review and classification, Archives of Computational Methods in Engineering, 27, 1153–1185, 2020.

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):

[no answer]

Map III - Técnicas de Reparação e Reforço

4.2.1. Title of curricular unit (PT):

Técnicas de Reparação e Reforço

4.2.1. Title of curricular unit (EN):

Repairing and Strengthening Techniques

4.2.2. Acronym of the areas associated to the CU (PT):

ECiv

4.2.2. Acronym of the areas associated to the CU (EN):

CivEng

4.2.3. Duration (PT):

Semestral 1ºS

4.2.3. Duration (EN):

Semiannual 1st S

4.2.4. Total working hours:

140.0

4.2.5. Total contact hours:

On-site (OS) - T-30.0; PL-15.0

4.2.6. % Remote contact hours:

0.00%

4.2.7. ECTS credits:
5.0

4.2.8. Responsible teacher and respective teaching load in the CU:
• José Manuel Sena Cruz - 15.0h

4.2.9. Other teaching staff and respective teaching load in the CU:
• Jorge Manuel Gonçalves Branco - 15.0h
• Maria Rosa Valluzzi - 15.0h

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (PT):
- Propor as técnicas mais adequadas para reparar/reforçar estruturas de betão
- Propor as técnicas mais adequadas para reparar/reforçar estruturas metálicas
- Propor as técnicas mais adequadas para reparar/reforçar estruturas de alvenaria
- Propor as técnicas mais adequadas para reparar/reforçar estruturas de madeira
- Comparar técnicas tradicionais e modernas (a nível material ou estrutural)

4.2.10. Intended learning outcomes (knowledge, skills and competences to be developed by the students) (EN):
- To propose suitable techniques for repairing/strengthening concrete structures
- To propose suitable techniques for repairing/strengthening steel structures
- To propose suitable techniques for repairing/strengthening masonry structures
- To propose suitable techniques for repairing/strengthening timber structures
- To compare traditional and innovative material/techniques

4.2.11. Syllabus (PT):
1.Conceitos básicos sobre reparação e reforço de estruturas.
2. Discutir os efeitos de transferência de cargas e comportamento a longo prazo.
3. Materiais e técnicas de reparação/reforço tradicionais vs. inovadoras/modernas.
4. Reparação e reforço de estruturas usando técnicas tradicionais e inovadoras ou modernas.
5. Reforço de estruturas metálicas.
6. Conceitos básicos de dimensionamento de estruturas de madeira. Reforço de estruturas de madeira.
7. Conceitos básicos de dimensionamento de estruturas de alvenaria. Reforço de estruturas de alvenaria.

4.2.11. Syllabus (EN):
1. Basic concepts about repairing/strengthening structures.
2. Discussion about load transfer and long-term effects.
3. Traditional repairing and strengthening materials/techniques vs. modern or innovative ones.
4. Repairing and strengthening concrete structures using traditional and modern or innovative ones.
5. Strengthening of steel structures
6. Basic design of timber structures. Strengthening of timber structures.
7. Basic design of masonry structures. Strengthening of masonry structures.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (PT):
Os conteúdos programáticos incluem uma introdução de conceitos básicos sobre reparação e reforço de estruturas, seguida da discussão dos efeitos de transferência de cargas e comportamento a longo prazo de estruturas reparadas/reforçadas. Posteriormente são apresentados e comparados materiais e técnicas de reparação/reforço tradicionais e inovadoras/modernas. É feita a comparação entre estas. Em seguida apresentam-se as diferentes técnicas de reforço aplicadas às estruturas de betão, metálicas, madeira e alvenaria, acompanhadas de casos de estudo. Para estas duas últimas técnicas são também introduzidos conceitos básicos de dimensionamento.

4.2.12. Evidence of the syllabus coherence with the curricular unit's intended learning outcomes (EN):
The syllabus includes an introduction to basic concepts on repairing/strengthening structures, followed by a discussion about load transfer and the long-term effects of repaired/strengthened structures. Subsequently, traditional and modern or innovative repairing and strengthening materials/techniques are presented and compared. Next, different strengthening techniques for concrete, steel, timber, and masonry structures are introduced. Case studies are also introduced. For the case of timber and masonry structures basic design concepts are detailed.

4.2.13. Teaching methodologies (including students' assessment) (PT):

A UC decorre durante 3 semanas de forma intensiva e com avaliação subsequente (formato modular). O funcionamento decorre em sala de aula, com aulas de manhã e trabalhos de grupo durante a tarde. Os trabalhos incluem o desenvolvimento de soluções de reforço para estruturas de betão, madeira e alvenaria. Todos os elementos de estudo são fornecidos antes de se iniciar a UC.

4.2.13. Teaching methodologies (including students' assessment) (EN):

The unit lasts for 3 weeks in a full-time way and with subsequent assessment (modular format). The unit follows an in-class approach, with classes in the morning and works during the afternoon (in a group). The assignments include the development of strengthening solutions for concrete, timber, and masonry structures. All study elements are provided before starting the unit.

4.2.14. Evaluation (PT):

A avaliação inclui os trabalhos práticos (peso na classificação de 50%) e um exame (peso na classificação de 50%).

4.2.14. Evaluation (EN):

The evaluation includes the assignments (accounting for 50% of the final grade) and an exam (accounting for 50% of the final grade).

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (PT):

Esta unidade curricular combina aulas de apresentação e discussão de conceitos e princípios teóricos, relacionados com a reparação e o reforço estrutural, com a aplicação destes princípios à resolução de uma série de problemas práticos, individuais e de grupo, pelos estudantes. Esta sequência de discussão teórica e aplicações práticas, bem como a apresentação oral de alguns dos problemas resolvidos, permite que os estudantes percorram progressivamente os diferentes objetivos de aprendizagem (ex: desde a reparação de construções de alvenaria ao reforço de estruturas de madeira) e os possam assimilar de forma lógica.

4.2.15. Evidence of the coherence between the teaching methodologies and the intended learning outcomes (EN):

This course combines lectures presenting and discussing theoretical concepts and principles, related to structural repair and reinforcement of constructions, with the application of these principles to the resolution of a series of practical problems, both individual and group, by the students. This sequence of theoretical discussion and practical applications, as well as the oral presentation of some of the problems solved, allows students to progressively go through the different learning objectives (e.g. from repairing masonry constructions to reinforcing timber structures) and assimilate them in a logical way.

4.2.16. Bibliography (PT):

Matthys et al., Externally applied FRP reinforcement for concrete structure, Tecnhical Report TG 5.1, fédération internationale du béton (fib), Bulletin no. 90, ISBN 978-2-88394-131-1, 290 pp., 2019.
Bertolini-Cestari, C., Marzi, T., Conservation of historic timber roof structures of Italian architectural heritage: Diagnosis, assessment, and intervention, International Journal of Architectural Heritage, 12(4), 632-665, 2018.
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Julio et al., Guide for the Strengthening of Concrete Structures, Technical Report TG 8.1, fédération internationale du béton (fib), Bulletin no. 103, ISBN 978-2-88394-157-1, 336 pp., 2022.
Garbin, E., "Strengthening masonry structures", University of Padua, 2011.

4.2.16. Bibliography (EN):

Matthys et al., Externally applied FRP reinforcement for concrete structure, Tecnhical Report TG 5.1, fédération internationale du béton (fib), Bulletin no. 90, ISBN 978-2-88394-131-1, 290 pp., 2019.
Bertolini-Cestari, C., Marzi, T., Conservation of historic timber roof structures of Italian architectural heritage: Diagnosis, assessment, and intervention, International Journal of Architectural Heritage, 12(4), 632-665, 2018.
ISO 13822, Bases for design of structures - Assessment of existing structures, ISO International Standard, Switzerland, 2010.
Julio et al., Guide for the Strengthening of Concrete Structures, Technical Report TG 8.1, fédération internationale du béton (fib), Bulletin no. 103, ISBN 978-2-88394-157-1, 336 pp., 2022.
Garbin, E., "Strengthening masonry structures", University of Padua, 2011.

4.2.17. Observations (PT):

[no answer]

4.2.17. Observations (EN):
[no answer]

4.3. Curricular Units (options)

4.4. Study Plan

Map V - General Path - 1

4.4.1. Branches, variants, specialization areas, specialties or other forms of organization (if applicable)* (PT):

Percurso Geral

4.4.1. Branches, variants, specialization areas, specialties or other forms of organization (if applicable)* (EN):

General Path

4.4.2. Year:
1

4.4.3. Study plan

Curricular Unit	Scientific Area	Duration	Working Hours	Contact Hours	% remote CH	Type	Optional	ECTS
Seismic Behaviour and Structural Dynamics	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
History of Construction and of Conservation	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
Inspection and Diagnosis of Historical Buildings	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
Restoration and Conservation of Materials	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
Structural Analysis Techniques	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
Repairing and Strengthening Techniques	CivEng	Semiannual 1st S	140.0	OS: PL-15.0; T-30.0	0.00%		No	5.0
Dissertation	CivEng	Semiannual 2nd S	588.0	OS: TO-15.0	0.00%		No	21.0
Integrated Project of Historical Buildings	CivEng	Semiannual 2nd S	252.0	OS: S-20.0; TO-15.0	0.00%		No	9.0
Total: 8								

4.5. Percentage of ECTS through distance learning

4.5. Percentage of ECTS credits of curricular units taught mainly through distance learning.

0.0

4.6. Curriculum restructure observations

4.6. Observations. (PT)

[no answer]

4.6. Observations. (EN)

[no answer]

5. Teaching staff

5.1. List of Teachers responsible for coordinating the implementation of the study cycle

• *Daniel Vitorino Castro Oliveira*

5.2. Study programme's teaching staff

Name	Category	Degree	Link	Specialist	Employment regime	Information
Daniel Vitorino Castro Oliveira	Professor Associado ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
Paulo José Brandão Barbosa Lourenço	Professor Catedrático ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
José Manuel Sena Cruz	Professor Associado ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
Graça Fátima Moreira Vasconcelos	Professor Associado ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
Maria Isabel Brito Valente	Professor Auxiliar ou equivalente	PhD Structural Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID

Name	Category	Degree	Link	Specialist	Employment regime	Information
Jorge Manuel Gonçalves Branco	Professor Auxiliar ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
Petr Kabele	Professor Catedrático ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted OrcID
Luca Pelà	Professor Associado ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted OrcID
Maria Rosa Valluzzi	Professor Associado ou equivalente	PhD Civil Engineering	Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018		100	Submitted OrcID
Nuno Adriano Leite Mendes	Investigador	PhD Civil Engineering	Career Researcher (Article 3, line l) of DL-74/2006, as amended by DL-65/2018		100	Submitted CienciaVitae OrcID
					Total: 1000	

5.2.1. Teacher's curricular file

5.2.1.1. Personal Data - Daniel Vitorino Castro Oliveira

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Associado ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2003

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

1618-9367-53E3

Orcid

0000-0002-8547-3805

5.2.1.2. Affiliation Research Units - Daniel Vitorino Castro Oliveira

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Daniel Vitorino Castro Oliveira

Year	Degree or Title	Scientific Area	Institution	Classification
1993	Five-years degree in Civil Engineering (Major in Structures)	Civil Engineering	University of Porto	16 out of 20
1996	Master Degree in Civil Engineering Structures	Civil Engineering	University of Porto	Very Good (maximum grade)

5.2.1.4. Pedagogical education - Daniel Vitorino Castro Oliveira

Pedagogical education relevant to teaching
How to prepare students for lessons and how to adapt lessons to their needs - adaptive flipped model.
Problem/Project-Based Learning (PBL): motivations, contexts, models and outcomes.
To involve students in group assessments: peer assessment.
Alternative assessment methods.
The Classroom Game: strategies for promoting participation in the classroom.

5.2.1.5. Distribution of teaching service - Daniel Vitorino Castro Oliveira

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Strength of Materials	Bachelor in Civil Engineering	60.0		60.0						
Dynamic analysis and earthquake engineering	Master in Civil Engineering	75.0	75.0							
Dissertation	Master in Civil Engineering	15.0							15.0	
Seismic Behaviour and Structural Dynamics	European Master in Structural Analysis of Monuments and Historical Construction	45.0	30.0		15.0					
Integrated Project	European Master in Structural Analysis of Monuments and Historical Construction	15.0							15.0	
Dissertation	European Master in Structural Analysis of Monuments and Historical Construction	15.0							15.0	
BIM based rehabilitation and sustainability analysis	European Master in Building Information Modeling	5.0		5.0						
Risk Management and Assessment	Master in Sustainable Construction and Rehabilitation	23.0	15.0		8.0					
Structures and Seismic Risk	Bachelor in Civil Protection and Territory Management	60.0		60.0						
Thesis	Doctoral Program in Civil Engineering	105.0							105.0	

5.2.1.1. Personal Data - Paulo José Brandão Barbosa Lourenço

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Catedrático ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

1996

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

3214-4E20-6B43

Orcid

0000-0001-8459-0199

5.2.1.2. Affiliation Research Units - Paulo José Brandão Barbosa Lourenço

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Paulo José Brandão Barbosa Lourenço

Year	Degree or Title	Scientific Area	Institution	Classification
1990	Licenciate	Civil Engineering	University of Porto	18/20

5.2.1.4. Pedagogical education - Paulo José Brandão Barbosa Lourenço

5.2.1.5. Distribution of teaching service - Paulo José Brandão Barbosa Lourenço

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
History of Construction and Conservation	MSc in Structural Analysis of Monuments and Historical Constructions	30.0	20.0	10.0						
Structural Analysis Techniques	MSc in Structural Analysis of Monuments and Historical Constructions	24.0	16.0	8.0						
Dissertation	MSc in Structural Analysis of Monuments and Historical Constructions	15.0							15.0	
Thesis	Civil Engineering PhD Program	60.0							60.0	
Thesis	Sustainable Built Environment	15.0							15.0	

5.2.1.1. Personal Data - José Manuel Sena Cruz

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Associado ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2004

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

F710-589B-A1BA

Orcid

0000-0003-3048-1290

5.2.1.2. Affiliation Research Units - José Manuel Sena Cruz

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - José Manuel Sena Cruz

Year	Degree or Title	Scientific Area	Institution	Classification
1995	Bachelor in Civil Engineering	Civil Engineering	University of Porto	16/20
1998	MSc in Civil Engineering	Structures	University of Porto	Very Good (Maximum Grade)
2022	Habilitation	Civil Engineering	University of Minho	Approved unanimously

5.2.1.4. Pedagogical education - José Manuel Sena Cruz

Pedagogical education relevant to teaching
Advanced social media (7 hours of training)
Mobile video workshop (8 hours of training)

5.2.1.5. Distribution of teaching service - José Manuel Sena Cruz

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Dissertation	Integrated Master in Civil Engineering	15.0							15.0	
Repair and Strengthening Techniques	Advanced Masters in Structural Analysis of Monuments and Historical Constructions	15.0	10.0		5.0					
Integrated Project	Advanced Masters in Structural Analysis of Monuments and Historical Constructions	15.0			15.0					
Dissertation	Advanced Masters in Structural Analysis of Monuments and Historical Constructions	15.0							15.0	
Dissertation	Master in Structural Engineering	0.8							0.8	
Concrete Structures II	Master in Structural Engineering	45.0		45.0						
Dissertation	Master in Civil Engineering	1.1							1.1	
Design of Reinforced Concrete and pre-stressed structures	Master in Civil Engineering	60.0			60.0					
Material Systems for Aerospace Applications	Master in Aerospace Engineering	5.0	3.0		2.0					
Advanced BIM datasystems and interoperability	Building Information Modeling BIM A+	5.0			5.0					
PhD thesis	Doctoral Programme in Civil Engineering	75.0							75.0	

5.2.1.1. Personal Data - Graça Fátima Moreira Vasconcelos

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Associado ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2005

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

1B1A-7775-B5AD

Orcid

0000-0001-6201-0552

5.2.1.2. Affiliation Research Units - Graça Fátima Moreira Vasconcelos

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Graça Fátima Moreira Vasconcelos

Year	Degree or Title	Scientific Area	Institution	Classification
1996	Bachelor	Civil Engineering	University of Porto	15/20
1999	Master	Civil Engineering	University of Minho	Very Good

5.2.1.4. Pedagogical education - Graça Fátima Moreira Vasconcelos

5.2.1.5. Distribution of teaching service - Graça Fátima Moreira Vasconcelos

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Dissertation	Structural Analysis of Monuments and Historical Construction	15.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	
Restoration and Conservation of Materials	Structural Analysis of Monuments and Historical Construction	45.0	30.0	0.0	15.0	0.0	0.0	0.0	0.0	
Integrated Project of Historical Buildings	Structural Analysis of Monuments and Historical Construction	20.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	
Strength of Materials	Bachelor in Civil Engineering	60.0		60.0						
Mechanics of Materials	Bachelor in Civil Engineering	60.0		60.0						
Conservation of Ancient Buildings and Monuments	Master in Sustainable Construction and Rehabilitation	45.0	30.0		15.0					
Thesis	Doctoral Program in Civil Engineering	60.0							60.0	
Thesis	Doctoral Program in Sustainability of Built Heritage	30.0							30.0	

5.2.1.1. Personal Data - Maria Isabel Brito Valente

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Auxiliar ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Estruturas de Engenharia Civil

Scientific field of this degree (EN)

Structural Engineering

Year in which this degree was obtained

2007

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

A61F-7C34-049B

Orcid

0000-0003-0502-9956

5.2.1.2. Affiliation Research Units - Maria Isabel Brito Valente

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Maria Isabel Brito Valente

Year	Degree or Title	Scientific Area	Institution	Classification
1997	Bachelor	Civil Engineering	Faculty of Engineering, University of Porto	14
2000	Master	Structural Engineering	Faculty of Engineering, University of Porto	Very Good

5.2.1.4. Pedagogical education - Maria Isabel Brito Valente

Pedagogical education relevant to teaching

5.2.1.5. Distribution of teaching service - Maria Isabel Brito Valente

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Design of Structures with FRP Materials	FRP++ European Master Course in Advanced Structural Analysis and Design using Composite Materials	12.0	6.0		6.0					
Dissertation	FRP++ European Master Course in Advanced Structural Analysis and Design using Composite Materials	7.5							7.5	
BIM A+1 Management of information and collaboration in BIM	Building Information Modeling BIM A+, European Master	45.0	30.0		15.0					
Dissertation	Building Information Modeling BIM A+, European Master	15.0							15.0	
Inspection and Diagnosis of Historical Buildings	Master in Structural Analysis of Monuments and Historical Construction	15.0	10.0		5.0					
Dissertation	Master in Structural Analysis of Monuments and Historical Construction	15.0							15.0	
Integrated Project of Historical Buildings	Master in Structural Analysis of Monuments and Historical Construction	15.0							15.0	
Analysis of Steel Structures	Bachelor in Civil Engineering	60.0		60.0						
Structural Mechanics	Bachelor in Civil Engineering	60.0		60.0						
Project in Civil Engineering	Bachelor in Civil Engineering	16.0	4.0	9.0					3.0	
Steel and Composite Structures	Master in Civil Engineering	35.0		35.0						
Dissertation	Master in Civil Engineering	15.0							15.0	
Thesis	PhD Program in Civil Engineering	60.0							60.0	
Advanced Structural Analysis	Master in Aerospace Engineering	10.0	10.0							
Steel Structures	Master in Structural Engineering	5.0		5.0						
Dissertation	Master in Structural Engineering	1.5							1.5	

5.2.1.1. Personal Data - Jorge Manuel Gonçalves Branco

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Auxiliar ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2008

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

9917-4E2B-C3F1

Orcid

0000-0002-3976-0360

5.2.1.2. Affiliation Research Units - Jorge Manuel Gonçalves Branco

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Jorge Manuel Gonçalves Branco

Year	Degree or Title	Scientific Area	Institution	Classification
2000	Bachelor	Civil Engineering	University of Minho	15/20
2003	Master	Civil Engineering	University of Minho	Very Good

5.2.1.4. Pedagogical education - Jorge Manuel Gonçalves Branco

Pedagogical education relevant to teaching
Docência+ (2020 edition): Transformação

5.2.1.5. Distribution of teaching service - Jorge Manuel Gonçalves Branco

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Construction Lab	Master in Architecture	60.0	20.0	40.0						
Conservation and Restoration of Built Heritage	Master in Architecture	45.0		45.0						
Seminar B3: Pathology and Rehabilitation	Master in Architecture	20.0		20.0						
Structural and Geotechnical Design	Master in Civil Engineering	33.0	5.5	27.5						
Dissertation	Doctoral Programm in Civil Engineering	130.0							130.0	
Dissertation	Doctoral Programm in Architecture	15.0							15.0	

5.2.1.1. Personal Data - Petr Kabele

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Catedrático ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Civil Engineering

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

1995

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

-

Orcid

0000-0003-4402-0196

5.2.1.2. Affiliation Research Units - Petr Kabele

5.2.1.3. Other degrees or titles - Petr Kabele

Year	Degree or Title	Scientific Area	Institution	Classification
1992	Master of Engineering (officially recognized as Ing. by CTU in Prague)	Civil Engineering	The University of Tokyo	N/A

5.2.1.4. Pedagogical education - Petr Kabele

5.2.1.5. Distribution of teaching service - Petr Kabele

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Structural Mechanics 3	Civil Engineering	26.0	26.0							
Theory of Elasticity and Strength of Materials	Civil Engineering	39.0	39.0							
Deformation and Failure of Materials	Physical and Materials Engineering	26.0	13.0	13.0						
Nonlinear Analysis of Materials and Structures	Civil Engineering	8.0	4.0	4.0						
Numerical Methods in Engineering Problems	Civil Engineeiring	6.0	3.0	3.0						
Structural Analysis Techniques	Advanced Masters in Structural Analysis of Monuments and Historical Constructions	21.0	14.0		7.0					
Numerical Methods in Engineering Problems	Civil Engineering	6.0	3.0	3.0						

5.2.1.1. Personal Data - Luca Pelà

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Associado ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2009

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

-

Orcid

0000-0001-7760-8290

5.2.1.2. Affiliation Research Units - Luca Pelà

5.2.1.3. Other degrees or titles - Luca Pelà

Year	Degree or Title	Scientific Area	Institution	Classification
2005	2-year Master Degree in Civil Engineering	Civil Engineering	University of Ferrara	110 out of 110 cum laude
2002	3-year Bachelor Degree in Civil Engineering	Civil Engineering	University of Ferrara	110 out of 110 cum laude

5.2.1.4. Pedagogical education - Luca Pelà

5.2.1.5. Distribution of teaching service - Luca Pelà

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
History of Construction and of Conservation	SAHC - Advanced Masters in Structural Analysis of Monuments and Historical Constructions	15.0	10.0		5.0	0.0				
Building Structures	Master in Civil Engineering	40.0	20.0		20.0					
Foundation Structures	Master in Structural and Construction Engineering	20.0	10.0	10.0						
Inspection Analysis and Restoration of Historical Constructions	Master in Structural and Construction Engineering	20.0	10.0		10.0					
Experimental Techniques	Master in Structural and Construction Engineering	10.0	5.0		5.0					

5.2.1.1. Personal Data - Maria Rosa Valluzzi

Link to the HEI

Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018

Category

Professor Associado ou equivalente

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Civil Engineering

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2001

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

-

Orcid

0000-0003-0216-5549

5.2.1.2. Affiliation Research Units - Maria Rosa Valluzzi

5.2.1.3. Other degrees or titles - Maria Rosa Valluzzi

Year	Degree or Title	Scientific Area	Institution	Classification
1995	Five-years degree in Civil Engineering	Civil Engineering	University of Padova, Italy	110 cum laude

5.2.1.4. Pedagogical education - Maria Rosa Valluzzi

5.2.1.5. Distribution of teaching service - Maria Rosa Valluzzi

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Restoration and Laboratory	Five-year degree in Building Enigineering - Architecture	155.0	85.0		30.0	20.0	10.0		10.0	
Structural Problems of Monuments and Historic Buildings	Five-year degree in Building Engineering - Architecture	95.0	25.0	40.0			5.0	10.0	15.0	
Repairing and Strengthening Techniques	European Master in structural Analysis of Historical Constructions	15.0	10.0		5.0					
Dissertation	Five-year degree in Building Engineering - Architecture	60.0								60.0
Dissertation	European Master in Structural Analysis of Historical Constructions	15.0								15.0
Dissertation	Doctoral program in Conservation of Historical Constructions	20.0								20.0

5.2.1.1. Personal Data - Nuno Adriano Leite Mendes

Link to the HEI

Career Researcher (Article 3, line l) of DL-74/2006, as amended by DL-65/2018

Category

Investigador

Associates Degree

Yes

Degree

PhD - 3rd Cycle

Scientific field of this degree (PT)

Engenharia Civil

Scientific field of this degree (EN)

Civil Engineering

Year in which this degree was obtained

2012

Institution that conferred this degree

[no answer]

Specialist Title (Art. 3, paragraph g) of DL no. 74/2006, of March 24, as amended by DL no. 65/2018, August 16)

No

Scientific field of the specialist title (PT)

[sem resposta]

Scientific field of the specialist title (EN)

[no answer]

Year when the specialist title was obtained

-

Dedication regime in the institution submitting the proposal (%)

100

CienciaVitae

8115-7F93-00C6

Orcid

0000-0002-1796-686X

5.2.1.2. Affiliation Research Units - Nuno Adriano Leite Mendes

Research Unit	FCT Classification	Higher Education Institution (HEI)	Type of Research Unit
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional

5.2.1.3. Other degrees or titles - Nuno Adriano Leite Mendes

Year	Degree or Title	Scientific Area	Institution	Classification
2006	Graduation in Civil Engineering	Civil Engineering	University of Minho	16/20

5.2.1.4. Pedagogical education - Nuno Adriano Leite Mendes

5.2.1.5. Distribution of teaching service - Nuno Adriano Leite Mendes

Curricular Unit	Study programme	Total contact hours	T	TP	PL	TC	S	E	OT	O
Thesis	Doctoral Program in Civil Engineering	15.0							15.0	
Steel Structures	Master in Structural Engineering	15.0		15.0						
Inspection and Diagnosis of Historical Buildings	Structural Analysis of Monuments and Historical Construction	15.0	10.0		5.0					
Structural Dynamics and Earthquake Engineering	Master in Structural Engineering	45.0		45.0						

5.3. Team Details

5.3.1. Total teachers / FTE

5.3.1.1. Total number of teachers.

10

5.3.1.2. Total number of FTE.

10.00

5.3.2. Career teaching staff" – teachers of the study programme integrated in the teaching or research career.*

Link with HEI	% of the total of FTE
Career Teacher (Article 3, line k) of DL-74/2006, as amended by DL-65/2018	90.00%
Career Researcher (Article 3, line l) of DL-74/2006, as amended by DL-65/2018	10.00%
Other link	0.00%

5.3.3. Academically qualified teaching staff" – staff holding a PhD*

Academically qualified teaching staff	FTE	Percentage*
Teaching staff holding a PhD (FTE):	1000	100.00%

5.3.4. Specialised teaching staff.

Specialized teaching staff	FTE	Percentage*
PhDs specialised in the fundamental area(s) of the study programme (% total FTE)	10.0	100.00%
Staff specialised in the fundamental areas of the study programme not holding PhDs in these areas (% total FTE)	0.0	0.00%

Specialists not holding a PhD, but with a Specialist Title (DL 206/2009) in the fundamental area(s) of the study programme (% total FTE)	0.0	0.00%
% of faculty specializing in core area(s) (% total FTE)		100.00%
% of the faculty holding a PhD specialized in the core area(s) (% specialized faculty)		100.00%

5.3.5. Teaching Staff integrated in Research Units of the Institution, its subsidiaries or integrated centers (article 29, DL no. 74/2006, as written in the DL no. 65/2018)

Description	FTE	Percentage*
Teaching Staff integrated in Research Units of the Institution, its subsidiaries or integrated centers	7.0	70.00%

5.3.6. Stability and development dynamics of the teaching staff

Stability and tranning dynamics	FTE	Percentage*
Career teaching staff of the study programme with a link to the institution for over 3 years	6.0	60.00%
FTE number of teaching staff registered in PhD programmes for over one year	0.0	0.00%

5.4. Teaching staff development

5.6. Observations. (PT)

[no answer]

5.6. Observations. (EN)

[no answer]

Observations. (PDF)

[no answer]

6. Teaching staff observations

6.1. Number and employment type of the technical, administrative and management staff allocated to the study programme. (PT)

A Universidade do Minho dispõe de serviços centrais, com intervenção transversal a todas as UOEI, com cerca de 130 funcionários em regime de exclusividade, incluindo serviços de gestão académica, apoio à internacionalização, apoio às atividades de educação, gestão e acreditação da qualidade, núcleo de acreditação e catalogação de cursos, assim como bibliotecas, distribuído da seguinte forma:
- Unidade de Serviços de Gestão Académicos: 2 dirigentes, 15 técnicos superiores, 1 técnico de informática, 1 coordenador técnico e 12 assistentes técnicos;
- Unidade de Serviços de Apoio à Internacionalização: 1 dirigente, 9 técnicos superiores e 2 assistentes técnicos;
- Unidade de Serviço de Apoio às Atividades de Educação: 1 dirigente, 10 técnicos superiores, 2 especialistas de informática, 4 assistentes técnicos e 15 assistentes operacionais;
- Unidade de Serviços de Documentação e Bibliotecas: 3 dirigentes, 12 técnicos superiores, 1 técnicos de informática, 25 assistentes técnicos e 1 assistente operacional;
- Núcleo de Acreditação e Catalogação de Cursos: 1 dirigente, 1 especialista de informática e 1 assistente técnico;
- Colégio Doutoral: 1 técnico superior;
- Unidade de Serviços de Gestão e Acreditação da Qualidade: 1 dirigente e 5 técnicos superiores.

A Escola de Engenharia dispõe ainda do seguinte pessoal técnico, administrativo e de gestão no apoio aos cursos:
- Conselho Pedagógico: 5 técnicos superiores;
- Conselho Científico: 2 técnicos superiores e 1 assistente técnico;
- Departamento de Engenharia Civil: 5 técnicos superiores, 1 técnico informático, 1 coordenador técnico e 3 assistentes técnicos;
- Centro de Investigação ISISE: 1 técnico superior e 2 técnicos de laboratório.

6.1. Number and employment type of the technical, administrative and management staff allocated to the study programme. (EN)

The University of Minho has central services, with intervention across all the UOEI, with around 130 employees on an exclusive dedication, including academic management services, support for internationalization, support for education activities, quality management and accreditation, accreditation and cataloguing of courses, as well as libraries, distributed as follows:
- Academic Management Services Unit: 2 managers,15 senior technicians, 1 informatic technical, 1 coordinator technical and 12 technical assistants;
- Internationalization Support Services Unit: 1 manager, 9 senior technicians, 2 technical assistants;
- Teaching Activities Support Service Unit: 1 manager, 10 senior technicians, 2 computer specialists, 4 technical assistants, 15 operational assistants;
- Documentation and Library Services Unit: 3 managers; 12 senior technicians, 1 computer technicians, 25 technical assistants and 1 operational assistant;
- Accreditation and Course Cataloguing Unit: 1 manager,1 computer specialist and 1 technical assistant;
- Doctoral College: 1 senior technician;
- Quality Management and Accreditation Services Unit: 1 manager and 5 senior technicians.

The School of Engineering has technical, administrative, and management staff supporting this study programme, as follows:
- Pedagogical Council: 5 senior technicians;
- Scientific Council: 2 senior technicians and 1 technical assistant;
- Department of Civil Engineering: 5 senior technicians, 1 computer technician, 1 coordinator technical and 3 technical assistants;
- ISISE Research Center: 1 senior technician and 2 laboratory technicians.

6.2. Qualifications of the technical, administrative, and management staff that will support the study programme. (PT)

Unidade de Serviços de Gestão Académicos: 3 mestres, 19 licenciados, 9 trabalhadores com 12.º ano.
Unidade de Serviços de Apoio à Internacionalização: 4 mestres, 7 licenciados e 1 trabalhador com o 12.º ano.
Unidade de Serviço de Apoio às Atividades de Educação: 1 doutorado, 4 mestres, 8 licenciados, 4 trabalhadores com 12.º ano e 15 trabalhadores com 11.º ano ou menos.
Unidade de Serviços de Documentação e Bibliotecas: 1 doutorado, 5 mestres, 12 licenciados, 20 trabalhadores com o 12.º ano e 4 trabalhadores com 11.º ano.
Núcleo de Acreditação e Catalogação de Cursos: 3 licenciados.
Colégio Doutoral: 1 doutorado.
Unidade de Serviços de Gestão e Acreditação da Qualidade: 4 mestres e 2 licenciados.
Conselho Pedagógico: 1 mestre e 4 licenciados
Conselho Científico: 2 licenciados e 1 trabalhador com o 12º ano
Departamento de Engenharia Civil: 4 mestres, 1 licenciado e 5 trabalhadores com 12º ano
Centro ISISE: 1 mestre e 2 trabalhadores com 12º ano

6.2. Qualifications of the technical, administrative, and management staff that will support the study programme. (EN)

Academic Management Services Unit: 3 masters, 19 graduates, 9 collaborators with 12th grade.
Internationalization Support Services Unit: 4 masters, 7 graduate and 1 collaborator with 12th grade.
Teaching Activities Support Service Unit: 1 doctorate, 4 masters, 8 graduates, 4 collaborators with 12th grade and 15 collaborators with 11th grade or lower.
Documentation and Library Services Unit: 1 doctorate, 5 masters, 12 graduates, 20 collaborators with the 12th grade and 4 collaborators with the 11th grade.
Accreditation and Course Cataloguing Unit:3 graduates.
Doctoral College: 1 doctorate.
Quality Management and Accreditation Services Unit: 4 masters and 2 graduates.
Pedagogical Council: 1 master and 4 graduates
Scientific Council: 2 graduates and 1 collaborator with 12th grade
Department of Civil Engineering: 4 masters, 1 graduate and 5 collaborators with 12th grade.
ISISE Research Center: 1 master, and 2 collaborators with 12th grade.

7. Facilities, partnerships and support structures

7.1. Have there been significant changes in facilities and equipment since the previous assessment procedure?

[ ] Yes [X] No

7.1.1. If yes, provide a brief explanation and rationale for the changes made. (PT)

[no answer]

7.1.1. If yes, provide a brief explanation and rationale for the changes made. (EN)

[no answer]

7.2. Have there been significant changes in national and international partnerships relevant to the study programme since the previous assessment procedure?

[ ] Yes [X] No

7.2.1. If yes, provide a brief summary of those changes. (PT)

[no answer]

7.2.1. If yes, provide a brief summary of those changes. (EN)

[no answer]

7.3. Have there been significant changes in structures supporting the teaching and learning processes since the previous assessment procedure?

[ ] Yes [X] No

7.3.1. If yes, provide a brief summary of those changes. (PT)

[no answer]

7.3.1. If yes, provide a brief summary of those changes. (EN)

[no answer]

7.4. Have there been significant changes in internships and / or in-service training, protocols with the respective entities and guarantee of effective monitoring of students during internship since the previous assessment procedure?

[ ] Yes [X] No

7.4.1. If yes, provide a brief summary of those changes. (PT)

[no answer]

7.4.1. If yes, provide a brief summary of those changes. (EN)

[no answer]

8. Assessment parameters for the Cycle of Studies

8.1. Students enrolled in the study programme in the current academic year.

8.1.1. Total number of students enrolled.

12.0

8.1.2. Characterization by Gender.

Gender	Percentage
Masculino	41.7
Feminino	58.3

8.1.3. Number of students enrolled by curricular year.

Curricular year	Students enrolled
1st curricular year	12

8.1.4. Possible additional information on student characterization. (PT)

Este curso de mestrado, financiado pela Comissão Europeia nos primeiros 10 anos de funcionamento como Erasmus Mundus, recebeu 465 estudantes de 75 países desde a sua primeira edição (ano letivo 2007/2008), e 84 alunos nas últimas 5 edições (média de 17 alunos por edição).
Apenas 14 (3%) dos 465 alunos são de Portugal. Os principais países de origem dos alunos são (ordem decrescente): Itália, EUA, Grécia, Canadá, India, Espanha, Irão, Colômbia, México e Portugal.
As diferentes escalas de avaliação usadas nos países de origem dos candidatos impossibilitam a definição de uma nota equivalente para cada aluno numa escala comum semelhante à escala Portuguesa. As classificações de "15" e "17" usadas na tabela são indicativas.

This masters course, funded by the European Commission for the first 10 years of its operation as an Erasmus Mundus program, has received 465 students from 75 countries since its first edition (2007/2008 academic year), and 84 students in the last 5 editions (an average of 17 students per edition).
Only 14 (3%) of the 465 students are from Portugal. The students' main countries of origin are (in descending order): Italy, USA, Greece, Canada, India, Spain, Iran, Colombia, Mexico, and Portugal.
The different grading scales used in the candidates' countries of origin make it impossible to define an equivalent grade for each student on a common grading scale, similar to the Portuguese one. The grades of "15" and "17" used in the table are indicative.

[no answer]

8.2. Demand for the study programme - Students

Parameter	Second-to-last year	Last year	Current year
N.º de vagas / No. of openings	50	50	50
N.º de candidatos / No. of candidates	98	103	91
N.º de admitidos / No. of admissions	89	96	85
N.º de inscritos no 1º ano, 1ª vez / No. of enrolments in 1st year 1st time	15	21	12

8.2. Demand for the study programme - Grades

Parameter	Second-to-last year	Last year	Current year
Nota de candidatura do último colocado / Grade of the last candidate to be admitted	15	15	15
Nota média de entrada / Average entry grade	17	17	17

8.3. Academic Results.

8.3.1. Training efficiency.

Indicator	Third-to-last year	Second-to-last year	Last year
N.º de graduados / No. of graduates	11	15	20
N.º de graduados em N anos / No. of graduates in N years	11	13	20
N.º de graduados em N+1 anos / No. of graduates in N+1 years		2	
N.º de graduados em N+2 anos / No. of graduates in N+2 years			
N.º de graduados em mais de N+2 anos / No. of graduates in more than N+2 years			

8.3.2. Present a list of theses completed in the last three years, stating, for each, the title, year of completion and the final result (PT)

n.a.

8.3.2. Present a list of theses completed in the last three years, stating, for each, the title, year of completion and the final result (EN)

n.a.

8.3.3. Data on unemployment of study programme?s graduates (PT)

Considerando que cerca de 97% dos alunos que frequentam o Mestrado SAHC são estrangeiros, não é possível obter dados estatísticos oficiais para os diplomados deste curso.
O último inquérito aos antigos alunos realizado pelo Consórcio SAHC (240 inquiridos) forneceu as seguintes informações: 50% dos estudantes começaram a trabalhar imediatamente após a conclusão do programa; 26% encontraram um emprego nos 3 meses seguintes à conclusão do programa; 9% nos 6 meses seguintes; 14% demoram mais de 6 meses. Portanto, 76% dos estudantes conseguem emprego em menos de 3 meses.
O mesmo inquérito permitiu saber que: (a) 75% dos ex-alunos estão a trabalhar na área do programa SAHC; (b) a ocupação é de 31% em gabinetes de consultoria, 20% como alunos de doutoramento, 15% em instituições de ensino superior, 13% na construção, 9% com empresa própria, 6% em organismos governamentais e 6% noutras organizações.

8.3.3. Data on unemployment of study programme?s graduates (EN)

Considering that about 97% of the students attending the SAHC Master's degree are foreigners, it is not possible to obtain official statistics for graduates from this course.
The last alumni survey carried out by the SAHC Consortium (240 respondents) provided the following information: 50% of the students started working immediately after concluding the program; 26% found a job in the subsequent 3 months after concluding the program; 9% in the subsequent 6 months; 14% take more than 6 months. Therefore, 76% of the students are employed in less than 3 months.
The same survey allowed to know that: (a) 75% of the alumni are working within the field of the SAHC program; (b) the occupation is 31% in consulting offices, 20% as PhD students, 15% in higher education institutions, 13% in contractors, 9% in own practice, 6% in governmental bodies and 6% in other organizations.

8.4. Internationalization results.

8.4.1. Mobility of students, teachers and technical, administrative and management staff.

Indicator	Third-to-last year	Second-to-last year	Last year
Alunos estrangeiros matriculados no ciclo de estudos / Foreign students enrolled in the study programme	100	100	100
Alunos em programas internacionais de mobilidade (in) / Students in international mobility programs (in)			
Alunos em programas internacionais de mobilidade (out) / Students in international mobility programs (out)	55	67	71
Docentes estrangeiros (in) / Foreign teaching staff (in)	30	30	30
Docentes (out) / Teaching staff (out)			
Pessoal técnico, administrativo e de gestão estrangeiro (in) / Foreign technical, administrative and management staff (in)			
Pessoal técnico, administrativo e de gestão (out) / Technical, administrative and management staff (out)			

8.4.2. Participation in international networks relevant to the study programme (PT)

A Universidade do Minho pertence à rede de Universidades Parceiras do Programa Erasmus+. No âmbito deste programa, a UMinho tem obtido financiamento para mobilidade na Europa de alunos, ensino e formação para docentes, não docentes e não investigadores. O Departamento de Engenharia Civil tem, atualmente, acordos bilaterais realizados com praticamente todos os países europeus para mobilidades de estudos e ensino.
A Universidade do Minho pertence, desde 2022, à Aliança Europeia ARQUS, da qual fazem parte dez universidades europeias. Entre outras, esta iniciativa permite a captação e retenção de talento através do pagamento de bolsas de estudo para os ciclos de estudo de mestrado e doutoramento.
Por fim, realça-se que o próprio Mestrado SAHC é fruto de uma parceria internacional de 4 universidades europeias que oferecem este programa avançado de ensino desde 2007.

8.4.2. Participation in international networks relevant to the study programme (EN)

The University of Minho belongs to the network of Partner Universities of the Erasmus+ Program. Under this program, UMinho has obtained funding for mobility in Europe for students, teaching, and training for teachers, non-teaching staff and non-researchers. The Department of Civil Engineering currently has bilateral agreements with practically all European countries for student and teaching mobility.
Since 2022, the University of Minho has belonged to the ARQUS European Alliance, which includes ten European universities. Among other things, this initiative helps to attract and retain talent by paying scholarships for master's and doctoral courses.
Finally, the SAHC Master's Degree itself is the result of an international partnership between four top European universities that have been offering this advanced teaching program since 2007.

8.5. Results of research and development activities and/or advanced training and high-level professional development

8.5.1. Research unit(s), of the same knowledge field or specialization area as the study programme, in which teachers develop their scientific activity.

Teacher	Mark	HEI	Type of Research Unit	No. of teachers in the integrated study cycle
Instituto para a Sustentabilidade e Inovação em Estruturas de Engenharia (ISISE)	Excelente	Universidade do Minho (UM)	Institutional	7

8.5.2. List of the main projects and/or national and international partnerships in which the scientific, technological, cultural, and artistic activities developed in the area of the study programme are integrated, including (when applicable) information on the main funded projects and their respective funding. (PT)

As atividades de investigação relacionadas com o Mestrado SAHC enquadram-se no centro de investigação ISISE. O ISISE é um Centro de I&D criado em 2007, envolvendo os Departamentos de Engenharia Civil da Universidade de Coimbra e da Universidade do Minho. Em 2020, o ISISE foi avaliado como EXCELENTE pela FCT.
Em particular, o Grupo das Estruturas Históricas e de Alvenaria (HMS) do ISISE combina pesquisa fundamental avançada com aplicações de engenharia e necessidades industriais. Os seus principais projetos no domínio dos tópicos do Mestrado Internacional SAHC incluem:
- "ERC Advanced Grant" sobre "New Standards for Seismic Assessment of Built Cultural Heritage (STAND4HERITAGE)" (2019-2024), com financiamento de 3 M€.
- Coordenação da MSCA-ITN "Sustainable Building Lime Applications via Circular Economy and Biomimetic Approaches" (2021-2025), com financiamento de 3.7 M€.
- Envolvimento direto em 2 Agendas Mobilizadoras (Plano de Recuperação e Resiliência).
- 4 Marie Sk?odowska-Curie Individual Action Fellows (Rogiros Illambas, Mayank Mishra, Antonio D'Altri, Christiana Filippou).
- Liderança da Equipa de Projeto do Código Europeu de Alvenaria (EN 1996-1-1).

8.5.2. List of the main projects and/or national and international partnerships in which the scientific, technological, cultural, and artistic activities developed in the area of the study programme are integrated, including (when applicable) information on the main funded projects and their respective funding. (EN)

The research activities related to the SAHC Master's degree are part of the ISISE research center. ISISE is an R&D Center created in 2007, involving the Civil Engineering Departments of the University of Coimbra and the University of Minho. In 2020, ISISE was rated EXCELLENT by FCT.
In particular, ISISE's Historical and Masonry Structures (HMS) Group combines advanced fundamental research with engineering applications and industrial needs. Its main projects in the field of SAHC International Master's topics include:
- ERC Advanced Grant on "New Standards for Seismic Assessment of Built Cultural Heritage (STAND4HERITAGE)" (2019-2024), with funding of 3 M€.
- Coordination of the MSCA-ITN "Sustainable Building Lime Applications via Circular Economy and Biomimetic Approaches" (2021-2025), with funding of 3.7 M€.
- Direct involvement in 2 Mobilizing Agendas Consortia (Portuguese Recovery and Resilience Plan).
- 4 Marie Sk?odowska-Curie Individual Action Fellows (Rogiros Illambas, Mayank Mishra, Antonio D'Altri, Christiana Filippou).
- Project Team Leader for the European Masonry Code (EN 1996-1-1).

8.5.6. Activities of technological and artistic development, service providing to the community, and advanced training in the fundamental scientific area(s) of the study programme, and their effective contribution to the national, regional and local development, scientific culture, and cultural, sports and artistic fields. (PT)

As atividades de desenvolvimento tecnológico e artístico, prestação de serviços à comunidade e formação avançada relacionadas com o Mestrado Internacional SAHC são desenvolvidas no centro de investigação ISISE. O ISISE desenvolve a sua atividade em cooperação com a indústria, em projetos de I&D+I que são essenciais para uma sociedade baseada no conhecimento. O ISISE está ativo em todo o setor de construção, o que inclui construtores e serviços de construção, arquitetura e consultoria de engenharia, materiais de construção, e meio ambiente.
A ligação com a sociedade é desenvolvida ainda pela transferência de tecnologia sobre técnicas experimentais e numéricas avançadas, por exemplo, com aplicações em monumentos em todo o mundo (Palácio Presidencial em Lisboa, Catedral de Canterbury, Reino Unido, Catedral de Christchurch, Nova Zelândia, Archaeological Site Conservation and Management program for Wupatki National Monument, EUA) e no envolvimento em comités técnicos internacionais, por exemplo, ACI, CIB, COST, ECCS, IABSE, CEN, ISSMGE, fib, ICOMOS, TRB e RILEM.
Destaca-se, ainda, a organização de grandes eventos cientifico-técnicos internacionais em Guimarães, como: Simpósio IABSE 2019 "Towards a Resilient Built Environment Risk and Asset Management"; Conferência SHATiS'19 "International Conference on Structural Health Assessment of Timber Structures"; Congresso 4cihclb "International Congress on Luso-Brazilian Construction History".

The technological and artistic development, community service and advanced training activities related to the SAHC International Master's Degree are carried out at the ISISE research center. ISISE develops its activity in cooperation with industry, in R&D+I projects that are essential for a knowledge-based society. ISISE is active throughout the construction sector, which includes builders and construction services, architecture and engineering consultancy, building materials, and the environment.
The link with society is further developed by technology transfer on advanced experimental and numerical techniques, for example, with applications in monuments around the world (Presidential Palace in Lisbon, Canterbury Cathedral, UK, Christchurch Cathedral, New Zealand, Archaeological Site Conservation and Management program for Wupatki National Monument, USA) and involvement in international technical committees, for example, ACI, CIB, COST, ECCS, IABSE, CEN, ISSMGE, fib, ICOMOS, TRB and RILEM.
Also noteworthy is the organization of major international scientific and technical events in Guimarães, such as: IABSE 2019 Symposium "Towards a Resilient Built Environment Risk and Asset Management"; SHATiS'19 Conference "International Conference on Structural Health Assessment of Timber Structures"; 4cihclb Congress "International Congress on Luso-Brazilian Construction History".

8.6. Self-assessment report of the study programme prepared within the framework of the internal quality assurance system.

2022.2023 - Relatório de Curso Anual SAHC.pdf | PDF | 230.1 Kb

9. SWOT analysis of the study cycle and proposal for improvement

9.1. Global SWOT analysis of the study programme.

9.1.1. Strenghts. (PT)

- Mestrado avançado especializado na Engenharia da conservação;
- Formação multidisciplinar em engenharia estrutural, ciência dos materiais, e conceitos metodológicos;
- Relação profunda com investigação científica de topo;
- Pessoal docente doutorado e com investigação de nível internacional;
- Parcerias nacionais e internacionais bem estruturadas e consolidadas;
- Ensino/aprendizagem combina conceitos teóricos avançados com prática profissional;
- Funcionamento em sistema modular que melhora a aquisição de competências;
- Lecionação em língua inglesa e num contexto multicultural;
- Percentagem elevada de estudantes estrangeiros oriundos de países economicamente desenvolvidos;
- Acompanhamento dos estudantes numa base individual;
- Taxa de aprovação sistematicamente de 100% ou muito próxima.

9.1.1. Strenghts. (EN)

- Advanced master course focused on Engineering of conservation;
- Cross-disciplinary education in structural engineering, materials science, and methodological concepts;
- Close link to high-level research;
- Teaching staff with PhD and performing international-level research;
- Well-structured and consolidated national and international partnerships;
- Teaching/learning combines advanced theoretical concepts with professional practice;
- Functioning in a modular system that improves skills acquisition;
- Teaching in English and in a multicultural context;
- High percentage of foreign students from economically developed countries;
- Monitoring of students on an individual basis;
- Approval rate systematically at 100% or very close to it.

9.1.2. Weaknesses. (PT)

- A formação académica de base de alguns alunos é menos forte na área estrutural, não possibilitando um bom desempenho a todos os alunos do curso.

9.1.2. Weaknesses. (EN)

- The basic academic training of some students is less strong in the structural area, thus not enabling all course students to perform well.

9.1.3. Opportunities. (PT)

- Curso de Mestrado único no mundo sobre o estudo e análise de construções históricas;
- Elevada importância económica, social e cultural associada à conservação do património cultural edificado;
- Elevada motivação dos alunos para a aprendizagem.

9.1.3. Opportunities. (EN)

- Unique Master's course in the world on the study and analysis of historical buildings;
- High economic, social, and cultural importance associated with the conservation of built cultural heritage;
- Highly motivated students for learning experiences.

9.1.4. Threats. (PT)

- Alunos com formação académica diversa e origens culturais significativamente distintas;
- Concorrência de Mestrados Europeus com 60 ECTS na área da Engenharia Civil;
- Redução da atratividade do curso a nível internacional;
- Dificuldade na obtenção dos vistos por parte de alguns alunos não-europeus.

9.1.4. Threats. (EN)

- Students with diverse academic backgrounds and significantly different cultural origins;
- Competition of European Master's programmes with 60 ECTS in the field of Civil Engineering;
- Reduced international attractiveness of the program;
- Difficulty in obtaining visas for some non-European students.

9.2. Proposed improvement measures.

9.2.1. Improvement measures. (PT)

Todos os alunos realizam dois testes voluntários de diagnóstico (“pilot tests”) que incidem sobre os temas tecnicamente mais exigentes do curso. Estes testes são imedidatamente corrigidos e devolvidos aos alunos, juntamente com sugestões de estudo associadas a cada questão. Com estes testes, pretende-se conhecer os eventuais pontos menos fortes de cada um dos alunos.
A proposta de melhoria desta medida consiste em dedicar mais tempo ao auto-estudo atual (“self-study days”) e realizar sessões personalizadas de esclarecimento de dúvidas com os alunos que demonstrem maiores dificuldades.

9.2.1. Improvement measures. (EN)

All students take two voluntary diagnostic tests ("pilot tests") on the most technically demanding topics in the course. These tests are immediately corrected and returned to the students, along with study suggestions associated with each question. The aim of these tests is to find out what each student's weak points might be.
The proposal for improving this measure is to dedicate more time to actual self-study ("self-study days") and to hold personalized sessions to clarify doubts with the students who show the most difficulties.

9.2.2. Priority (high, medium, low) and time to implement each measure. (PT)

Prioridade alta, início do ano académico 2024/2025

9.2.2. Priority (high, medium, low) and time to implement each measure. (EN)

High priority, start of academic year 2024/2025

9.2.3. Implementation indicator(s). (PT)

Número de sessões personalizadas de esclarecimento de dúvidas com os alunos

9.2.3. Implementation indicator(s). (EN)

Number of personalized sessions to clarify doubts with the students