METHODOLOGY AND SYLLABUS FOR THE BUILDING DIAGNOSIS EXPERT

http://www.erasmus-diagnosis.eu
Erasmus+ Program. Ref.: 2017-1-ES01-KA203-038254
DIAGNOSIS Project
2017-1-ES01-KA203-038254

DIAGNOSIS
Innovating a crucial profession in building and construction sector in Europe

Intellectual Output O3: Training Programs

Methodology and Syllabus for the Building Diagnosis Expert

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Building Diagnosis Expert.
A new professional profile for building and construction sector in Europe

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1. Introduction

This Syllabus for “Building Diagnosis Expert” has been developed by the DIAGNOSIS Erasmus+ Project team as a key component of the scheme to support the profile and the training course for the “Building Diagnosis Expert”. Project was organised in the frame of ERASMUS+ PROGRAMME - COOPERATION FOR INNOVATION AND THE EXCHANGE OF GOOD PRACTICES STRATEGIC PARTNERSHIPS, number of the project 2017-1-ES01-KA203-038254. Project title: INNOVATING A CRUCIAL PROFESSION IN BUILDING AND CONSTRUCTION SECTOR DIAGNOSIS, Date of the project performance: 01. 11. 2017 – 30.10. 2019.

DIAGNOSIS project is promoted and supervised by ASSOCIATION REHABIMED from Barcelona, ES, and other Partners are: UNIVERSITAT POLITECNICA DE CATALUNYA, ES, UNIVERSITA DEGLI STUDI DI FERRARA, IT, WARSAW UNIVERSITY OF TECHNOLOGY, PL, POLISH ASSOCIATION OF BUILDING MANAGERS, PL, ASSOCIATION OF BUILDING SURVEYORS AND CONSTRUCTION EXPERTS, UK and CENTOFORM, IT.

Project intends to meet Europe 2020 growth strategy priorities on employment and education. The project takes into account also the EU Roadmap Opening up Education (04/2013) enhancing education and skills development through new technologies and underlining "insufficient supply of quality digital contents across languages, subjects and needs". At EU level, DIAGNOSIS takes into account Construction 2020 Strategy for the sustainable competitiveness of the construction sector and its enterprises (2012), in particular the related Action Plan aiming at the “improvement of specialised training and making the sector more attractive, in particular for blue-collar workers, technical colleges and universities. [...] It is necessary to better anticipate future skills and qualification needs, to attract a sufficient number of students to relevant construction professions and to create the conditions for a better working environment and career management, for a greater mobility of construction workers and for wider provision of cross-border services."

Syllabus created in the project is an academic document that communicates course information and defines expectations and responsibilities. It is a guide on what will be expected of participants in the course and, at the same time, it can tell to participants nearly everything they need to know about how the course will be run and what will be expected of them. The syllabus ensures a fair and impartial understanding between the university and students such that there is minimal confusion on policies relating to the course, setting clear expectations of material to be learned and effort on student's behalf to be put into the course.

More info at the project's website and under QR code:

http://www.erasmus-diagnosis.eu/
2. What is Diagnosis?

DIAGNOSIS project is aimed at defining the professional profile of the experts for the diagnosis of the built heritage and establishing the necessary contents for their training. The Project has specialized partners, both Universities and entities in the construction sector of Spain, Italy, UK and Poland. Association RehabiMed leads the project and assumes the projection of the results both between the Euro-Mediterranean university world and the entire sector involved, with the objective of consolidating this profile of expert among the specialties related to the rehabilitation of local heritage.

Building and construction sector in Europe is one of the sectors which suffered most the economic crisis in these last few years, and where for many reasons innovation and upgrading of competences is still difficult to develop. One important need of this sector is related to the lack of a specific professional profile: a diagnostic expert [3], an expert who can dialogue with owners of existing buildings or their representatives and at the same time with building and construction professionals, being the one who can use up-to-date technologies to analyze the building, detect and explain the needed interventions (i.e. for earthquakes prevention, for improving energy, structural and environmental comfort etc). This expert could - with specific socio-psychological and technical competences - inform and guide owners and building managers in planning interventions through a really aware and informed decision based on real data on their specific building.

The project general aim is to deepen knowledge about existing up-to-date technological tools for building assessment through the collaboration among international partners, and consequently to upgrade existing training tools and professional qualifications curricula in order to create a renewed professional profile in building and construction sector. The desired professional profile should include competences in: the use of up-to-date diagnostic tools, cross-disciplinary instrumental techniques and communication. Specific objectives of the project are as follows: upgrade and innovate existing training programs about up-to-date technological tools and methodologies for building assessment; improve the effectiveness of teaching and learning of up-to-date technological tools and methodologies for building assessment; increase the synergic use of up-to-date technologies, in an integrated way, with a team work approach and personal development; increase the cooperation among educational institutions and enterprises in EU for better employability.

New training programs are sustainable through their adoption by educational institutions participating to the project and implementation in the university curricula on: structural diagnosis tools and energy and environmental diagnosis tools; BIM and socio-psychological skills; Geomatics and remote sensing and 3D models production. The general subjects of the training program are presented at the table 2.1. Detailed description of the programme is provided in chapter 6.
Table 2.1. Elements of the Diagnosis courses programme
3. “Building Diagnosis Expert” - profile and functions

As the role of “Building Diagnosis Expert” has to be consolidated in the construction sector, it is important initially to define likely job functions involved, see fig. 3.1:

- To produce diagnosis by application of a precise methodology.
- To work with requirements ratings (structure, energy…) in line with European directives and national standards.
- To have clear requirements in reporting the condition of services.
- To inspect buildings.
- To identify building materials and systems.
- To identify building pathology, damages and defects.
- Data collection of all the necessary information, both documentary and within the building (visual information, collection with tools and analytical techniques).
- Interpreting damages and dysfunctions.
- To make a qualitative assessment.
- To make a quantitative assessment.
- Research skills

✓ Coordination of experts in different subjects.
✓ Communication skills (oral and writing)
✓ To establish conclusions. Final diagnosis
✓ To be independent and ethic in the conclusions, with seller and buyer

In order to deal with all this job functions, where the Building Diagnosis Expert is involved, we must consider that:

✓ Diagnosis is a specially complex mission for the Building Diagnosis Expert (it is outside rules and regulations)
✓ The Building Diagnosis Expert is required to master many disciplines (structures assessment, energy efficiency evaluation, graphical survey, traditional materials, construction systems, laboratory analysis, chemical analysis, etc.)
✓ In some aspects, the Building Diagnosis Expert could not have the specialist technical knowledge to be competent to report on the complexity of some building elements. It is required to recognise the limits of their own competence and to refer to appropriate experienced experts, when needed.
Figure 3.1. Synthesis of the Diagnosis Expert needed qualifications
4. Building Diagnosis Expert - professional demand from the market

- Pre-diagnosis for a homogeneous evaluation of buildings as a whole or parts of them. It could be used also to sale or buy a property.  
  Client: Administrations, large owners, private owners...

- Punctual report on specific damages and repair of failures (simple or complex) or preventive maintenance.  
  Client: Private owners, Administrations.

- Diagnosis of a building, prior to a rehabilitation project.  
  Client: Project owner or developer

**The diagnosis job requires to be prepared for:**

- Especially complex mission (outside rules and regulations).

- Mastery many disciplines is required (structures assessment, energy efficiency evaluation, graphical survey, traditional materials, construction systems, laboratory analysis, chemical analysis, etc.).

- Very often, the collaboration of experienced experts in different specialties are needed.
5. Methodology - how to implement this Syllabus?

5.1. Introduction to the Diagnosis blended learning course methodology

5.1.1. Essential Effective Blended Learning Best Practices

Blended learning is a form of education and self-improvement that mixes different styles of learning. Thanks to this, we can receive more effective results in science and self-development. There are many forms of presenting on what blended learning and what is the uniqueness of this method by giving various examples. Nowadays, openness to multi interdisciplinarity is the key to effective knowledge acquisition and development. However, it is worth distinguishing several features that characterize this methodology.

One of the many sources gives the following possibilities that are possible to obtain using blended learning. These include: delivery - various modes (direct and distance education), mixtures of technologies (Internet), chronology - synchronous and synchronous interventions, learning based on local practice and classroom learning, roles - multidisciplinary or professional groups, pedagogy - various pedagogical approaches, focus on different purposes, direction led by the instructor and independent or directed at the student.

According to the Clayton Christensen Institute, most blended learning works on one of these four models [2]:

- **Rotation**: students are rotating in different learning modes. At least one of them is online or digital.
- **Flex**: Students mainly learn online.
- **A La Carte**: Students learn online completely with an online instructor.
- **Enriched Virtual**: Students receive individual sessions with an instructor. Students can individually meet with an instructor and ask questions that are relevant to them at a given moment.

Generally, blended learning can be presented in 5 main cases:

- **Take it easy** - In the era of ubiquitous tests and exams, students and students are often just stressed out. It is forgotten that the effects will never be enough when we look from the perspective of a stressed student. Not all students are ready to go deep into the water right away. Sometimes it is worth waiting and giving time so that the student can calmly think what kind is to solve them. A calm approach to new challenges does not classify students but gives them time to become familiar with the subject, thus giving everyone equal opportunities in solving a given problem.
- **Get a clear picture** - There is nothing worse than not understanding the subject and problem that needs to be resolved. It is worth devoting more time to explaining a given problem, because otherwise you can simply waste someone's talent. Teachers continue to work closely with students or groups of students through mixed teaching. They lead lively class discussions to complement the ongoing thought processes. Students know that the teacher plays a role as valued and appreciated as technology. It brings better results.
- **Students as classroom leaders** - This is not a simple issue but letting students be teachers for a while can be a great way to increase engagement. As a result, students and students can see what they need to teach in a way that engages students in unique perspectives. They are
able to learn about coherent organization and planning. They can present projects from an instructional point of view. It gives them to prove and strengthen what they have learned. Not everyone has an innate ability to train, so it helps to develop.

- **Consider using movement** - Forcing students to sit in one place immediately determines the sense of boredom. Students and students need entertainment, stimulation and diversity. It's a good time to confuse the classroom with a digital playground.

Below is the example using a rotational model what was described above.

Phase 1: Watch a short and intentional movie about the problem our society is facing. Give students time to discuss at a round table and share their opinions.

Phase 2: Advertise a challenge for them. “Your job is to find a solution to the problem.” For the first time, break them into groups using digital and non-digital media.

Phase 3: A computer game spreads in the classroom at various terminals. Consider a deep understanding of the problem.

Phase 4: Create a project for developing the solution. Set criteria and a system of rewards for meeting certain milestones. Add some friendly competition to the mix.

Phase 5: Presentation day and project presentation. Summary, an important part of the solution's liquidity process is happening now. Pupils discuss projects and what can be done better.

The following are the characterisations for blended learning as it is practised today:

- The provision of supplementary resources for learning programmes that are conducted mainly in the traditional way, through institutionally supported virtual learning environments;
- Transformative course level practices underpinned by radical course designs which often make significant use of technology to replace other modes of teaching and learning.
- A holistic view of technology and learning, including the use of the learners' own technologies to support their learning.

5.1.2. Use of the term ‘blended learning’

To date, the differences and similarities between online, traditional distance and face – to- face traditional teaching have been little understood, leading to confused notions of “blend”. Through the 1990s the corporate training world spoke of blended...
learning as enhancements to the typical corporate training intervention: the short course.

Until now, the differences and similarities between all traditional methods of indirect and distance learning and methods for learning directly were little known. This led to an incorrect understanding of the term ‘blend’. In the 1990s, all methods of improving learning methods led to a shortening of its duration, i.e. to the form of the course. While direct training providers improve their courses with online elements and retain the value of face-to-face experiences, providers of distance learning courses converge on a mixed model from the other direction, offering optional printed manuals and additional face-to-face workshops.

The term ‘mixed learning’ has three basic meanings:
- An integrated combination of traditional learning with online approaches;
- A combination of media and tools used in the e-learning environment; and
- Combining a range of pedagogical approaches, regardless of the use of learning technologies.

5.2. Aims and objectives of the training programme

The programme aims to acquire and refresh basic knowledge and skills, which enable participants to master the work and the knowledge of DIAGNOSIS Expert the course is foreseen at the 5-6 EQF level with some differences in partners countries (Spain, Italy, Poland and UK).

ITALY for Diagnosis will work on EQF5:
With reference to Italian situation the opportunity to test the course content at EQF5 level helps to clarify, in a context of recent reforms, the overlaps among:
- ITS – IFTS courses (post-secondary level of instruction courses);
- Bachelor’s degree;
- “new” Bachelor’s degree with one-year internship at firms/industries (DM 987/2018).

POLAND for Diagnosis will work on EQF6/7:
With reference to Polish situation, courses will be organized the at EQF6 level for Bachelor’s degree, at EQF7 for Master Degree and also at the same 5/6 level for possible participants of free standing courses, wishing to develop their skills and knowledge at the industrial level.

SPAIN for Diagnosis will work on EQF7:
With reference to Spanish situation, courses will be organized at EQF7 level for a Master’s Degree and also at the same level for possible participants, wishing to develop their skills and knowledge at the industrial level.

UK for Diagnosis will work on EQF 5/6:
With reference to the UK situation, courses would be suitable for both levels 5 and 6. Level 5 for professionals wishing to upgrade their knowledge and understanding of diagnosis as an addition to their existing qualifications. Level 6 as part of a Bachelors degree level programme with or without honours plus part of the recently established construction degree apprenticeship programmes.

The structure of the course is be based on modular concept, meaning that the section and units of the course can be used independently. Blended learning designers from partners country of DIAGNOSIS project (trainers and tutors) will have the opportunity to build their own course planning based on the specific characteristics of the target group.

Also in the development of the course we should take into consideration another aspect that might be different for the training domain: the “training modules” content will be available on MOODLE (or any other suitable) platform and the training organizers will not only have the possibility to choose the specific
sections needed but also the methodology of delivering the training. This means the modules of learning can be made available on paper version, electronic version on CD-ROM and on e-learning platform depending on the methodology adopted. The training providers will be able to choose different types of delivery for the entire training or for different “training modules” according to each session or group of trainees (blended learning = face to face, e-learning).

5.2.1. Training Methodology

The proposed teaching and learning methodology is based on the following adult learning principles:

- The learning is self-directed.
- It fills an immediate need and is highly participatory.
- Learning is experiential (i.e., participants and the trainer learn from one another).
- Time is allowed for reflection and corrective feedback.
- A mutually respectful environment is created between trainer/tutor and participants.
- A comfortable environment is provided.

Training techniques suggested for DIAGNOSIS Programme include the following:

- Presentations - activities conducted by the trainer/tutor or a resource specialist to convey information, theories, or principles (workshops);
- Case Study Scenarios – written/oral presentation/study visit descriptions of real-life situations used for analysis and discussion (workshops and e-learning);
- Simulations - enactments of real-life situations (workshops and e-learning);
- Small Group Discussions - participants sharing experiences and ideas or problem solutions (workshops and e-learning).

Teaching methodology based on blended learning is above all the necessary knowledge for people who want to teach or be a teacher or an expert. In the broadly understood civil engineering, all such features correspond to all managerial occupations, eg construction diagnostics. That is why the following methodological summary is based on the diagnosis project.

5.2.2. Learning Modules

In order to achieve the aims and objectives of the training in DIAGNOSIS, the overall programme is divided into 3 modules which covers different hours of teaching with additional learning hours for each module of the training. The topics have been chosen following research among DIAGNOSIS specialists to establish what are the areas of widest possible interest to the majority of them.

The entire training programme is divided in the following training/learning modules:

M1. General subjects (methodology, materials, pathology, history of construction and final reports)
M2. Instrumental complements (social and transversal skills, legal and regulatory framework, survey modelling BIM, building inspection tools inspection and auxiliary techniques)
M3. Analysis (social framework, habitability and comfort, energy efficiency, structural safety or safety in use).

Detailed description of the modules is presented in Chapter 6.
### MODULE 1:

<table>
<thead>
<tr>
<th>Title</th>
<th>General subjects</th>
</tr>
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<tbody>
<tr>
<td>Sector</td>
<td>DIAGNOSIS Project</td>
</tr>
<tr>
<td>Main Target Audience</td>
<td>Definition of training contents for Building Diagnosis Expert</td>
</tr>
</tbody>
</table>

**Description of the module and general aims**

This introductory Section aims to put in value the importance of building stock rehabilitation from different sides, e.g. social, environmental, heritage, economical etc. Moreover, it aims to emphasize the fact that before the process of rehabilitation it is essential to realize a diagnosis in order to know the building, its components and its state of conservation. The module presents also the methodology that will allow to face rigorously the diagnosis process, establishing steps and procedures to get closer from the whole to the detail. This Section introduces the physical-chemical behaviour of materials and building systems emphasizing on changes and sequences of pathological processes. The effects of water, heat, physical-mechanical effects such as tensile strain, fatigue and wear under stress, among others, will be analysed and understood. This Section will also develop knowledge of the history of construction for the identification and recognition of the constructive systems and materials used throughout history, always in a local context. Likewise, skills will be acquired in the search and management of archival documentation related to buildings, and in the analysis of the building itself as an information element. Every diagnostic process ends in a final document that must be precise both in the language and in the conclusions. This Section also focuses on the writing of specific documents, which may have different objectives: from a specific damage assessment to the complete diagnosis of a building as a step prior to its rehabilitation.

**Training/Learning time**

<table>
<thead>
<tr>
<th>Duration period</th>
<th>Expected time of training 36/72 hours</th>
</tr>
</thead>
</table>
| Learning typology | X 1.1 Introduction | Course type example:  
|                  | IT - information technologies competent: 4 hours of training  
|                  | IT not competent: 8 hours of training |
|  | 1.2 Behaviour of construction materials and building systems: pathology | On line and remote (self-study, collaborative activities, etc.)
|  |  | Course type example:
|  |  | IT competent: 16 hours of training
|  |  | IT not competent: 32 hours of training
|  | 1.3 Construction history and documentation | In practice, on the job - guided tours to Diagnosis history and documentation Projects
|  |  | Course type example:
|  |  | IT competent: 12 hours of training
|  |  | IT not competent: 24 hours of training
|  | 1.4 Final reports | Course type example:
|  |  | IT competent: 4 hours of training
|  |  | IT not competent: 8 hours of training

### Tools required to carry out the module (ICT, equipment, etc.)
Level 6 according to the EQF classification. Those of the degree in architecture, technical architecture or building engineering. No specific prior knowledge is required, only interest for the intervention in existing buildings. Notions of chemistry, physics and mechanics. Physical and chemical aspects of matter. Characteristics, benefits and uses of construction materials. Normative Technical reference. Common constructive solutions. General culture and historical framework in the European architectural context. Architecture basics concepts about construction materials and systems common in the local geographic context, used in different historical moments. To have the ability to write technical reports related to the building sector. To master the technical vocabulary related to construction and pathology. To have knowledge of computer programs type "office", at user level.

### Learning Objectives (LO)
**Knowledge:**
- To understand the need to adopt an ethical behaviour and a position of impartiality in the exposed opinions, before a conflict of interests.
- Ability to add and discuss all the information collected during the diagnosis process and to draw clear and precise conclusions.
- Ability to write the resulting documents adjusted to the language of the profile of the recipient of the document (technician or user).
- To differentiate the various types of documents that may result from a diagnosis process, depending on your objectives. They can be reports, opinions, certificates, Building Inspection Reports, certificates of habitability or energy, etc., or complete diagnoses prior to the drafting of a rehabilitation project.
- To identify risk situations and design emergency measures to alleviate it.
- To recognize the social, economic, cultural and technical context in which the diagnosis of buildings is developed, to take it into consideration in the performance of diagnostic work.
- To explain the overall process of rehabilitation of the buildings and the context in which the diagnosis of them is developed.
- To interpret the diagnosis phase as a previous and necessary stage to the rehabilitation project, with great impact on the correct execution of the works.
- Identify the costs of the diagnosis.
- To define and identify different concepts regarding pathological processes.
- To describe and discuss the pathological processes associated with water and its effects on materials, considering the porous structure and water transport.
- To describe and discuss the pathological processes associated with stress-strain behaviour induced stress, second order effects, etc.
- To describe and discuss the pathological processes associated with the variation of temperature and its effects, cyclic processes and exhaustion by fatigue.
- To explain and interpret breaks of different types of materials under different actions.
- To define and interpret the processes of change in soils, deformation processes, water effects, thrusts, etc.
- To describe and interpret the pathology of conglomerates according to their behaviour against different chemical, mechanical, physical, etc.
- To describe and interpret the pathology of stone and ceramic materials according to their behaviour against different chemical, mechanical, physical, etc.
- To describe and interpret the pathology of metal materials according to their behaviour against oxidation-corrosion processes, embrittlement, corrosion under tension, etc.
- To describe and interpret the pathology of woods (lignocellulosic materials) according to their behaviour against different biotic, chemical, mechanical aggressions, etc.
- To describe and interpret pathological processes associated with the toxicity of materials, their volatile compounds, the radiation emitted the biological presence of pathogens, etc.
- To identify and estimate complex pathological processes (synergistic) in different constructive solutions, compatibility and incompatibility of materials.
- To recognize the history of architecture, in different periods, in the local context.
- To identify and define the historical construction with precision, regarding the materials and
construction systems used in the different historical moments.

- To differentiate and classify the materials and construction systems presented by the buildings, and relate them to their time of construction.
- To recognize the building as a document and source of information.
- To interpret the archival documentation in the study of the evolution of buildings.

Skills:

- To apply an organized and precise work methodology that guides the expert in the different stages to follow in the diagnosis processes of the buildings.
- To apply an organized and precise work methodology that guides the expert in the different stages to follow in the diagnosis processes of the buildings.
- To deduct the history and evolution of buildings, based on their knowledge and analysis.
- To apply patrimonial sensitivity, to identify and appreciate the architectural, historical - artistic and memory values of the building as a whole and / or its components.
- To use the bibliography, archives and documentation centers correctly.
- To write, illustrate and present orally, a general and detailed view of the evaluation carried out during the diagnosis, with a precise language, both in the description of the constructive elements and in the assessment of their status.
- To use graphic expression tools, image processing and infographic representation.

Competences:

- To discuss the importance of diagnosis in any rehabilitation process.
- To develop hypothesis of causes from symptomatic tables and initial data.
- To arguing the architectural and historical aspects of buildings and their components.
- To record all the process carried out, all the methodologies and data obtained and the reflections made throughout the diagnosis.
- To synthesize and evaluate the information collected during the diagnosis process, and draw clear and precise conclusions regarding the initial objective of evaluating a pathological process or a complete building. Generate the diagnosis.
- To draft general recommendations for intervention and emergency measures.
| Pedagogical methods used (self-study, group work, distance learning, etc.) | • The collaboration of external experts is not required.  
• Laboratories for the characterization of pathological materials and processes.  
• Experts in materials (materials engineers, chemists, geologists, etc.).  
• Specific regulations of materials and construction systems.  
• Experts in the study of buildings and their components, both in the building itself and in archives (archaeologists, historians, documentarists, etc.)  
• The collaboration of external experts is not required for the writing of the reports, although their collaboration may have taken place in the phase of data collection and analysis of some components of the study. |
| Evaluation and KPI – Key Performance Indicators | Evaluation can be accomplished by measuring factors which expresses the learner’s performance in reaching a LO.  

E.g.  
KPI 5 points – related to LO:  
To define and identify different concepts regarding pathological processes.  
Proper answer will give 5 points. (to be moderated by the tutor) |
## MODULE 2:

<table>
<thead>
<tr>
<th>Title</th>
<th>Instrumental complements</th>
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<tr>
<td>Sector</td>
<td>DIAGNOSIS Project</td>
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</table>

### Description of the module and general aims

This Section will work with the personal skills that a Building Diagnosis Expert must develop for his professional practice: from social relationships with clients, users and local administrations, to the organization and coordination of work groups, leadership and conflict management, or their ability to communicate both orally and in writing. This Section aims at identifying the legal and provision of services regulations that affect buildings and their components (European directives and national and local regulations), as well as aspects of professional civil responsibility. This Section also deals with the application of new skills and strategies for process management as well as the introduction of new integrated technologies to support both productivity and innovation through the construction sector digitization. Regarding diagnosis for the intervention (preservation as well as renovation) on existing buildings, those skills are strictly related to the present possibility of data acquisition, data extraction, analysis and representation into a unique parametric 3D model (platform). This Section also will provide the guidelines for the building inspection organization and management.

### Training/Learning time

**Expected time of training 38/76 hours**

<table>
<thead>
<tr>
<th>Duration period</th>
<th>Maximum duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning typology</td>
<td></td>
</tr>
</tbody>
</table>
| X 2.1 Soft and general technical skills | Course type example:  
IT competent: 6 hours of training  
IT not competent: 12 hours of training |
| X 2.2 Legal and regulatory framework | On line and remote (self-study, collaborative activities, etc.)  
Course type example:  
IT competent: 4 hours of training  
IT not competent: 8 hours of training |
| X | 2.3 Survey Modelling (BIM) | In practice, on the job - guided tours to BIM Projects  
Course type example:  
IT competent: 14 hours of training  
IT not competent: 28 hours of training |
|----------|--------------------------------------------------|
| X | 2.4 Building inspection, tools and auxiliary techniques | Course type example:  
IT competent: 14 hours of training  
IT not competent: 28 hours of training |

**Tools required to carry out the module (ICT, equipment, etc)**

Sensitivity towards the possible contributions of the interlocutors. Organizational capacity, Normative Technical reference:  
- European directives,  
- Legal corpus of national, regional and local scope.  
Historical references of the legal framework in the construction sector. General knowledge of the construction process. General knowledge of graphic survey techniques and tools. General knowledge of diagnostic techniques and methods and data acquisition tools. General knowledge of computer aided design applications for the construction sector. Basic concepts of statistics. Characteristics of common construction materials and systems.  
Behaviour and use of buildings.

**Learning Objectives (LO)**

**Knowledge:**  
- Communication and professional ethics.  
- To define ethical principles for all professional actions.  
- To interpret the contributions of the interlocutor and adapt to it.  
- To manage communication and empathy to give clear and adequate information to the circumstances.  
- To describe different socio-cultural areas to avoid any discrimination by culture, gender or beliefs,  
- Conflict resolution  
- To discuss an action strategy among multiple alternatives, evaluating participation and responsibilities  
- Teamwork and leadership  
- To define effective communication with the working group.  
- To set an example with a proactive role in the group.  
- To discuss decision making (listening, analysis, synthesis)
- To interpret the nature of the problems, seek solutions and shared results
- To describe the ability to "negotiate"
- To recognize conflict and crisis management.

**Skills:**
- To use a communication adjusted to the different interlocutors, from professional ethics.
- To apply leadership and teamwork.
- To organize work plans according to the needs of the inspections.
- To establish safety and health measures adapted to each case.
- To use correctly the bibliography and related legal regulations.
- To use the legal and regulatory framework applicable in each case, in a precise and adjusted to the environment, in any process of diagnosis.
- To analyse and correctly apply the legal regulations and resort to the related bibliography.
- To organize and solve processes of graphic survey of buildings.
- To use design software, 3D surveys and BIM modelling.
- To apply studies and good practices in the field of BIM modelling for the diagnosis, projects and management of existing buildings. To identify, choose and apply different techniques and tools for the characterization of materials.
- To identify, choose and apply different techniques and tools for the geometric verification of constructive elements.
- To choose and correctly use different measuring instruments to assess various parameters.
- To choose and organize auxiliary equipment and tools for inspection. Tasting campaigns, sampling, testing "in situ", etc.
- To use combined systems of diverse tests (END, etc.).
- To correlating different techniques of obtaining data.
**To communicate with diverse interlocutors getting and transmitting information in a tight and precise way.**

**Competences:**
- To contrast and correctly interpret the relationships with the social agents involved and with the work team itself.
- To formulate and generate work plans considering the organizational needs of safety and health regulations.
- To interpret, evaluate and argue the diagnosis based on the legal and regulatory framework applicable at all times.
- To create graphic representation of the buildings surveys
- To develop hypotheses and interpret BIM models for the diagnosis stage.
- To direct, organize and execute the inspection process.
- To understand and conclude the results of the inspection.

**Pedagogical methods used (self-study, group work, distance learning, etc.)**
- Managers of public buildings parks.
- Professionals of the real estate administration.
- Social workers, socio-cultural animators, etc.
- Experts in legislation applied to the construction sector.
- Testing laboratories.
- Experts in materials, machinery and testing mechanisms.

**Evaluation and KPI – Key Performance Indicators**
Evaluation can be accomplished by measuring factors which expresses the learner’s performance in reaching a LO.

E.g.
KPI 3 points – related to LO:
- To define the work plan.
Proper answer will give 3 points. (to be moderated by the tutor)
# MODULE 3:

<table>
<thead>
<tr>
<th>Title</th>
<th>Analysis</th>
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<tbody>
<tr>
<td>Sector</td>
<td>DIAGNOSIS Project</td>
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<tr>
<td>Main Target Audience</td>
<td>Definition of training contents for Building Diagnosis Expert</td>
</tr>
<tr>
<td>Description of the module</td>
<td>An integral diagnosis should include social issues that affect the use</td>
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<tr>
<td>and general aims</td>
<td>and maintenance of buildings. In this section sociodemographic, socio-</td>
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<td></td>
<td>economic and socio-spatial concepts such as the immigration, gentrification,</td>
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<tr>
<td></td>
<td>vulnerability or energy poverty are introduced. This section:</td>
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<td></td>
<td>- provides the basis for analysing buildings as a whole following an</td>
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<td></td>
<td>iterative process, and from obtaining provision of services</td>
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<td>information of the different construction elements that make up</td>
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<td>their enclosures, as well as the services and facilities that</td>
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<td></td>
<td>affect the habitability, comfort and healthiness of its users.</td>
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<td></td>
<td>- provides the bases for analysing buildings following an iterative</td>
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<td>process, and from obtaining provision of services information of</td>
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<td>the different construction elements that make up their enclosures,</td>
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<td>as well as the services and facilities that affect the current</td>
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<td>requirements limiting demand and energy efficiency.</td>
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<td>- will develop the structural analysis of the building as a whole,</td>
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<td>and of the different structural subsystems, following an iterative</td>
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<td>process from obtaining provision of services information and</td>
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<td>structural valuation.</td>
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<td></td>
<td>- will develop the analysis of the building and of the different</td>
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<td></td>
<td>building elements that affect safety in use, in accessibility and</td>
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<td></td>
<td>in all services, following an iterative process from obtaining</td>
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<td></td>
<td>provision of services information, occupation, etc.)</td>
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</table>

<table>
<thead>
<tr>
<th>Training/Learning time</th>
<th>Expected time of training 76/152 hours</th>
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<tbody>
<tr>
<td>Duration period</td>
<td>Maximum duration</td>
</tr>
<tr>
<td>Learning typology</td>
<td>X 3.1 Social framework</td>
</tr>
</tbody>
</table>

Course type example:
- IT competent: 4 hours of training
- IT not competent: 8 hours of training
| X | 3.2 Habitability and comfort | On line and remote (self-study, collaborative activities, etc.)  
Course type example:  
IT competent: 20 hours of training  
IT not competent: 40 hours of training |
| X | 3.3 Energy efficiency | In practice, on the job - guided tours to Energy Efficiency Projects  
Course type example:  
IT competent: 16 hours of training  
IT not competent: 32 hours of training |
| X | 3.4 Structural safety | Course type example:  
IT competent 28 hours of training  
IT not competent: 56 hours of training |
| X | 3.5 Safety in use | Course type example:  
IT competent: 8 hours of training  
IT not competent: 16 hours of training |

**Tools required to carry out the module (ICT, equipment, etc)**

- Basic concepts about housing policies.
- Basic concepts of health, welfare and risks related to habitability in buildings.
- Mastery of terminology and the basic language of economics, sociology and multiculturalism.
- Professional ethics
- Administrative documents for the evaluation of the existing building
- Basic concepts of physics: fluid dynamics (heat, humidity, air circulation), acoustics, hygroscopicity and environmental indicators
- Domain of terminology and technical language (Technical Building Code)
- Administrative documents for the evaluation of energy efficiency in existing buildings
- Basic concepts of physics: laws of thermodynamics; electricity
- Basic concepts of operation of the systems of sanitary hot water, air conditioning, lighting and ventilation
- Basic concepts of mechanics and materials resistance.
- Structural systems and their evolution and development over time.
- Analysis of efforts and tensions.
- Basic concepts of calculation.
| Administrative documents for the evaluation of the existing building |
| Reference Technical Regulations |
| Basic concepts of installation systems, common deficiencies, health risks |
| Identification of structural systems and their behaviour to fire |
| Mastery of terminology and technical language (sectorization, risk, occupation, evacuation, fire resistance, etc.) |

**Learning Objectives (LO)**

**Knowledge:**
- To identify social conditions that affect the use, habitability and comfort in buildings.
- To identify sources of information and previous work as support documentation.
- To define key socio-demographic, socio-economic and socio-spatial indicators for understanding, at different scales, the state of buildings.
- To relate the properties and chemistry of the materials with the issues of health, health, environmental pollution.
- To recognize environmental criteria: thermal comfort, relative humidity, air renewal, lighting, noise and vibrations.
- To identify the appropriate equipment for taking measurements and tests.
- To relate the properties of the materials with the questions of thermal conductivity and hygroscopicity.
- To identify the appropriate equipment for taking measurements and tests.
- To identify the energy assessment tools, simulation or calculation programs suitable for each type of diagnosis to be performed (Calener, Dialux ...)
- To recognize the usual energy efficiency indicators for the diagnosis and energy evaluation of buildings.
- To master the concepts of structural safety, limit states, safety factors, etc.
- To prospect, with precise methodologies, the structural elements of the buildings.
- To understand the structural behaviour of the building (isostability, hyperstability), and express in outline the state of qualitative loads, with the help of sketches and other infographics.
- To identify and evaluate qualitatively dysfunctions associated with terrain-foundations behaviour.
- To identify and evaluate qualitatively the dysfunctions associated with the behaviour of the horizontal structure (beams and slabs)
- To identify and evaluate qualitatively the dysfunctions associated with the behaviour of arches, vaults and domes.
- To identify and evaluate qualitatively the dysfunctions associated with the behaviour of hyperstatic structures.
- To identify and evaluate qualitatively the dysfunctions associated with accidental situations (fire, earthquake, etc.)
- To relate the properties of materials with fire behavior.
- To identify risks in relation to fire and its severity: calculation of risk content; risk coefficient for people; danger factor for goods; factor corresponding to the action of smoke.
- To identify the breaches in accessibility and evacuation according to the visual inspection and the evaluation bases.
- To identify the breaches of the systems of facilities according to the visual inspection and the bases of evaluation (risk by moving vehicles, by the action of lightning, etc.)
- To identify the social conditions that affect the safety and use of buildings

**Skills:**

- To document the current state of buildings in relation to the use, occupation, maintenance, property regime, urban and sociological environment.
- To use already existing socio-demographic, socio-economic and socio-spatial indicators.
- To use simple documentation management tools, data processing and infographic development.
- To choose the appropriate formats (surveys, interviews, files and other tools of the social sciences) for the methodological collection of social data
- To apply methodology for the inspection of buildings. Data collection (Architecture, construction, dynamics of use, systems and installations)
- To determine the key health concepts to be analysed: risk of water presence and humidity; Collection and disposal of waste; indoor air quality and ventilation; quality of drinking water supply; hygienic equipment; water evacuation.
- To determine the key acoustic concepts to analyze: limit values of reverberation, noise and vibrations.
- To use simple tools and small tools for the evaluation of environmental and habitability parameters: verification of gases in fume outlets, luxometers, sound level meters, hygrometers, thermographic cameras, photographic machines, endoscopes, ammeters, etc.
• To manipulate simulation and evaluation programs (lighting, condensation, reverberation, etc.)
• To analyse the current state of buildings based on available documentation, visual inspection and evaluation bases (domestic hot water, heating, cooling, lighting and equipment, acoustic conditions, tightness, humidity and their origin, air quality, contaminants)
• To determine the current state of buildings from an iterative process of identification, analysis and determination of environmental dysfunctions and / or affecting health and comfort.
• To apply methodology for the inspection of buildings. Data collection (Architecture, construction, systems and installations, dynamic data, invoices, usage dynamics).
• To determine the key concepts to analyse (thermal transmittances, thermal loads, efficiency of the equipment, comfort measures, infiltrations).
• To use simple tools and small tools for the evaluation of energy parameters: fluxometers, luxometers, hygrometers, thermographic cameras, photographic machines, endoscopes, ammeters, etc.
• To manipulate basic programs of simulation, evaluation and energy certification.
• To identify and use the appropriate equipment for taking measurements and tests.
• To analyse the current state of buildings based on available documentation, visual inspection and evaluation bases (limitation of demand, envelope performance, domestic hot water systems, heating, cooling, lighting and equipment).
• To determine the current state of buildings from an iterative process of identification, analysis and determination of energy dysfunctions.
• To choose and organize equipment and auxiliary tools for conducting "in situ" tests, non-destructive structural tests.
• To choose and use elementary calculation software with solvency.
• To apply methodology for the inspection of buildings. Data collection (Architecture, construction, systems and installations, dynamic data, invoices, usage dynamics).
• To determine the current status of the buildings in terms of their safety in case of fire from: the available documentation, the visual inspection and the evaluation bases.
• To determine the degree of accessibility of a building and compliance with regulations of safety measures according to use (occupation, slipperiness of soil, entrapment drowning, etc.)
• To analyse the current state of the buildings regarding the security of the systems of facilities from: the available documentation, the visual inspection and the bases of evaluation.
• To manipulate small tools for the verification of gases in fume outlets, sampling tools and analysis of
environmental pollutants related to the systems of installations (chemical, biological, vibrations), luxometers, etc.
- To use simulation programs for thermal load, combustibility, occupancy calculation, etc.

**Competences:**
- To estimate the needs, characteristics, shortcomings and economic, cultural and social limitations of the communities occupying buildings.
- To design "ad hoc" methodologies for sociodemographic, socio-economic and socio-spatial inspection of buildings.
- To develop methodologies and protocols for the characterization, location and evaluation of vulnerable areas.
- To relate social conditions with habitability and comfort in buildings.
- To interpret a plan for research and analysis of environmental contaminants.
- To evaluate the state of a building in terms of its habitability benefits.
- To assess serious and/or extreme situations and propose emergency measures.
- To evaluate different sampling systems and decide on criteria for a research plan for environmental quality and sanitation.
- To relate the constructive systems of the envelope of the buildings with the benefits and the limitation of the energetic demand.
- To relate building installation systems with performance and energy efficiency.
- Interpret the results of the simulation, calculation and energy evaluation of buildings.
- To evaluate the state of a building in terms of its benefits of environmental comfort and habitability and relate it to the limitation of demand and energy efficiency.
- To assess serious and/or extreme situations and propose emergency measures.
- To evaluate different sampling systems and decide evaluation criteria for an energy certification.
- To interpret, evaluate and justify the injuries related to the structural systems of buildings.
- To direct, organize and execute processes for the assessment of the structural safety of buildings based on their own knowledge or with the collaboration of experts in structural calculation.
- To draft general recommendations for intervention and emergency measures.
- To assess the building’s non-compliances in terms of safety of use according to current regulations.
- To discerning the serious breaches of the minor regarding safety of use in buildings.
- To design adaptation solutions for compliance with the safety of use in public buildings.
### Pedagogical methods used (self-study, group work, distance learning, etc.)

- Social agents, professionals in the health and health sector
- Material characterization laboratory
- Experts in the detection of biotic agents (fungi, bacteria, parasites and other infectious or contagious diseases)
- Experts in detection of environmental pollutants
- Laboratories and tooling for sampling and analysis of environmental contaminants
- Experts in Industrial Engineering, identification recognition and performance evaluation of systems of facilities
- Experts in insulation and acoustic conditioning
- Experts in Bioengineering and measurement of waves, radiation, electromagnetic networks and other pollutants.
- Laboratories and tools for sampling and analysis of biotic agents and environmental pollutants
- Experts in health and identification of diseases related to habitability and environmental quality.
- Experts in energy efficiency, energy certification
- Experts in industrial engineering, identification, recognition and evaluation of the performance of systems of installations
- (domestic hot water, heating, cooling, ventilation, etc.)
- Experts in calculation of structures.
- Laboratories and tools for sampling and analysis of structural elements and systems
- Industrial engineers experts in management of Licenses of activities
- Fire laboratories for determination of properties in materials without documented specifications
- Laboratories and tools for sampling and analysis of environmental contaminants related to the systems of facilities (chemical, biological, vibrations).
- Experts in the use of simulation, evaluation and fire behaviour programs

### Evaluation and KPI – Key Performance Indicators

Evaluation can be accomplished by measuring factors which expresses the learner’s performance in reaching a LO.

E.g.

**KPI 2 points – related to LO:**
- To recognize environmental criteria: thermal comfort,
  Proper answer will give 2 points. (to be moderated by the tutor)
5.2.3. Blended Learning Course Phases

Blended learning courses could be divided into the phases [4]:

Preliminary Phase:
In the preliminary phase, which starts few days prior to the face-to-face session, participants get basic information about blended learning. They have the first opportunity to get to know their course colleagues and identify themselves as IT-information technologies competent or IT non-competent student (important for internet user for blended courses).

If IT competent, they already get into contact with various technical tools suitable for blended learning courses such as (a)synchronous communication user interactions (chat, forum, and VoIP - Voice of internet protocol). Participants get the necessary information to successfully use those tools and instruments and are supported by experienced tutors.

Face-to-Face Session:
In the face-to-face session, technical and instructional knowledge are transmitted by using different didactical methodologies. Moreover, a project work (content) is initiated to be finalised during the follow-up phase in e-learning and e-tutoring for IT-competent. The IT not competent students will continue the course in face to face sessions with the tutor operating the IT tools, following workshops, exercises and evaluation in presence.

Follow-up Phase
The IT competent participants continue to work in a collaborative approach on their blended learning course using communication tools and e-learning environment (i.e. Moodle). The work will be supported by an online tutor. Regular online sessions give the participants the opportunity to get advice and information from other group members and the tutor and will promote an exchange of experiences and good practice. Particular attention will be paid to monitoring learners’ interactions and progresses in the MOODLE tool by means of logging data and specific tools.

5.3. Organization of the training

The implementation of the training program allows for great flexibility and freedom in the implementation of the tasks entrusted. Flexibility refers to the choice of delivery methods and the implementation schedule. Considering that the program will be provided by various providers of educational services in different countries, the training program will be implemented in various socio-economic and cultural contexts with various educational requirements. This allows multi-disciplinary problem solving, which is definitely an added value for young people. Each individual provider of educational services will examine the best method of delivery, taking into account the context, content and availability of digital devices, IT competences of the participants. Thanks to this, everyone is able to find a perfect set of assessment criteria that will help achieve better results in education, which is the basis for young people.

To start introducing new learning methods such as blended learning, you should start with changing your thinking. Each new methodology involves a risk, because there are always people who do not like the methods and get into a polemic, so start with mental preparation using the small steps method. It is worth asking students what they think about this type of teaching, which is also part of blended learning, by starting a conversation with students, thus treating them differently than in a typical school, where students are not even able to get closer to the teacher.

Blended learning is not as important as communication. Thanks to it, you can start thinking about its introduction, only later about organization and training. Training should be based on the
gradual introduction of individual elements of the method, eg leaving the class and trying to complete certain school tasks in groups. It can interest and inspire what is undoubtedly the most important when introducing new teaching methods. Another approach, for example, immediately introducing everything can have a completely opposite effect, thus for a long time to discourage students from learning something new.

5.4. Evaluation of training

5.4.1. General notes
The training evaluation will be based on the accomplishment of the learning objectives assigned on each module and on other usability methods. Some exercises and tests will be assigned to the learners at the end of the learning programme in order to evaluate the learning level of each specific module. A number of key performance indicators (KPIs) will be individually defined in the specific subject of each module and measured in the assessment (framework descriptor). Moreover, other parameters concerning the (effective) use of e-learning platform will be used in order to measure the training evaluation, such as the frequency of use or a regular flow of study activities.

ITALY: Training refers to the Quality Assurance System, which has been introduced in Italy to evaluate Bachelor’s courses performance. Since 2010 (L. 240/2010) has been introducing, for the University in the Italian context, a “Quality Assurance System” in order to apply a unified quality evaluation method to measure the quality and the impact of didactical activities and the results of the bachelor’s courses. The Single Annual Study Programs (SUA-CdS) is the instrument through which each CdS expresses the objectives it proposes to achieve. The SUA-CdS provides all the information to students, families and stakeholders, useful for:

- clarify the objectives of the training;
- describe the training plan and the learning environment;
- illustrate the results of the training;
- set out the organizational structure and responsibilities regarding the QA (Quality Assurance);
- indicate the results of the review activity carried out annually.

POLAND: University Quality Assurance System was developed in 2009 and gives the detailed instruction about maintaining the quality of teaching, including:

- educating students at the highest level while maintaining the specificity of the field of study pursued;
- raising the importance of didactic work;
- introducing mechanisms necessary to achieve high quality education;
- creating common areas for the implementation of didactic and scientific activities;
- adapting the curricula to the expected learning outcomes formulated taking into account the needs of the labor market and modern achievements of science and technology;
- maintaining a high level and constant development of teaching staff.

SPAIN: In order to be officially valid, EEES degrees must undergo an assessment process by the Agency for the Quality of the University System of Catalonia (AQU Catalunya): verification. These Educational proposals must be drawn up in accordance with the UPC’s standards and AQU Catalunya's guidelines. The Generalitat, who must authorize the implementation, in accordance with the programming criteria that it established and the availability of funding, must verify a copy of the Programmes. Finally, the Council of Ministers establishes the official nature of
the university degrees and orders their inclusion in the Register of Universities, Centres and Degrees.

UK: In order to be officially valid, degrees must form part of a degree awarded by a recognised degree institution that offers degree-level courses in the UK and is called a ‘recognised’ body. Recognised bodies are higher learning institutions that can award degrees and are registered with the UK Government’s Office for Students. The Higher Education Funding Council for England is responsible for processing applications in conjunction with the Quality Assurance Agency who prepare formal advice. Successful applications are formally notified by the Privy Council of the United Kingdom, which is a formal body of advisers to the Sovereign of the United Kingdom.

5.4.2. Diagnosis courses - types of exercises - examples.

1. Simple descriptive question, to be answered with relevant number of words.
   Example:
   Please describe main elements of Building Information Modeling Execution Plan (BEP) for building renovation. Use maximum 50 words.

2. „Drag and drop the words” questions (when sentence has to be filled with listed words or statements)
   Example:
   Please drag and drop correct answer to the relevant place. xxxxxxxxxx is responsible for preparation of Health and Safety plan for building renovation project in Poland: site manager client designer subcontractor

3. Test questions type A with YES / NO answer
   Example:

Please mark correct answer. Site Manager is responsible for preparation of Health and Safety Plan for building renovation project in Poland
YES     NO

4. Test questions type B with TRUE / FALSE answer
   Example:
   Please mark correct answer. Site Manager is not responsible for preparation of Health and Safety Plan for building renovation project in Poland
   TRUE     FALSE

5. Different types of games with students groups.

6. Test question type C with one correct answer to be chosen from the list
   Example:
   Mark the correct answer - who is responsible for preparation of Health and Safety plan for building site renovation project in Poland:
   a) site manager
   b) client
   c) designer
   d) subcontractor

7. Test question type D with multiple correct answers to be chosen from the list
   Example:
   Mark the correct answers - who is not responsible for preparation of Health and Safety plan for building renovation project in Poland:
   a) site manager
   b) client
   c) designer
   d) subcontractor
8. Comparison of H&S related photos – proper solution vs. not proper solution, or proper vs. improper use of tools.
Example:
Mark the photo with proper Diagnostics works solution

i.e. PHOTO of personnel working with proper tool for the task

i.e. PHOTO of personnel working with not proper tool for the task

A) B)

9. Problem solving questions (problem related to Diagnosis work on height is given, short answer should cover the proper solution)
Example:
One of the diagnosis expert was injured on height, at the scaffolds. What actions should be taken? Prepare answer with max. 50 words.

10. Matching questions A, two words / sentences mentioned in two columns, course participant should match them.
Example:
Match element from column A with element from column B
A
important tool for checking the humidity
B
hygrometer
Diagnosis experts working on scaffolds should use
safety belts

11. Matching questions B, words / sentences mentioned in one column and figures in the second one, course participant should match them.
Example:
Match element from column A with figure from column B

12. “Finding the mistakes” question
Example:
Examine the text – i.e. description of diagnosis expert works or examine the given picture showing diagnosis expert at work and find minimum xx mistakes related to standard work during diagnosis process. List them below.

5.5. Course Planning – Advise for Trainers

The course is designed to help the DIAGNOSIS experts in their every-day life and the students who are interested to work as DIAGNOSIS specialists in future - that did not have much experience in this type of work in their countries. The main aim is to facilitate the role of professional personnel who deal with matters related to wide aspect of diagnostics of buildings.

The course will lead to an increased awareness and greater knowledge of the concepts of modern Diagnostic skills and procedures in the industry. By working through the materials participants become more accurate and more appropriate in a range of key DIAGNOSIS works contexts.

Therefore, in the following paragraphs the trainer will find some information, checklists that can help to get started in blended learning.
It describes in general the processes for producing and delivering blended learning courses and explains how we should change our way of thinking about this process when compared with the traditional face-to-face learning.

Blended learning combines e-learning with typically classroom training, combining the best aspects of both (24h accessibility and face-to-face interaction). **DIAGNOSIS** courses involve activities for the classroom, independent personal study, interaction with peer learners and tutors. A combination of different tools is used in accordance with the requirements of the learning processes.

When starting the course, the trainer may use face to face or distant activities depending on the learners, i.e. according to their experiences and the dexterities that they have. The distant activities may be interchanged with face to face activities, in order for the learners not to feel isolated and to be encouraged to continue if they get disappointed. The trainers are acting more as facilitators rather than conventional teachers.

Content is presented to the student in different formats (text, Power Point Presentation or Flash Animation with audio or video overlay, Interactive exercises, etc.). Periodically, students are given opportunities to practice what they have learned. These activities typically contain instructions for performing an activity and then ask the student questions about the activity. Students can then compare their own answers with answers that the course author would have given.

Whenever trainers/tutors prepare their courses, they are making a series of decisions aimed at creating a “design,” or a sequence of activities for what learners will do in a course. When making the necessary decisions the following should be kept in mind: a) meet the needs of the actors (learners, facilitators, tutors, authors, support persons); b) meet the requirements of the learning process; c) take into consideration the technological infrastructure available and d) take into consideration the resources available.

One of the most important factors for success is to respond to the personal development needs of target groups/end users. In order to achieve this the following questions are to be answered:

- **Do you know who your learners are?** (Learner needs)
  - Ability levels; IT competences, backgrounds; interest levels; attention spans; ability to work together in groups; prior knowledge and skills, attitudes and learning experiences; special needs or accommodations; and learning preferences.

- **Where do you want to go?** (Course goals – as described in detailed syllabuses)

- **Which time do you expected to reach training objectives in?** (Course length; relationship between course length, training methodologies and results – as described in syllabuses)

- **What would you like the learners to gain out of this course?** Foundational knowledge (facts, principles, and concepts), applications (thinking skills, managing complex projects), integrations (connecting ideas, information), understanding the personal and social implications of this subject, making changes in theirs feelings, interests, and values. Identify the aims or outcomes that you expect your learner to achieve as a result of his/her participation. These goals are formalized in the framework table as Learning Objectives for each module.
e. How will the learners and yourself know if the objectives have been achieved? (Objectives – as described in the syllabuses)
Objectives are behavioural in nature and are specific to performance. Objectives tell what you will be observing in a learner’s performance and describe criteria by which you can measure performance against. List the important facts, key concepts, skills, or key terms and glossary that you intend to cover. How will you and the learners know if they have achieved these objectives? You can also prepare an outline with key learning outcomes. What kinds of interaction, feedback and assessment would be appropriate? Objectives represent tangible indicators of performance that tell the teacher, to what extent a learner is progressing in any given task. These are represented in the framework table as the KPIs examples for each module.

f. How are your students going to reach the objectives? (Content)
Tutor should consider the following:
- What type of learning activities and experiences do learners need?
- Learning activities can range from easy to hard tasks, depending on learner abilities. Select or develop learning activities that reflect the principles of active learning.
- What resources will the learners need?
- How will they have access to the content?
- What type of reflective communication will help them with the content and connect it to their own lives?
  □ Html pages
  □ Videos
  □ Sound files
  □ Documents
  □ External Resources

□ Printed material from the Trash Book

g. What are the key concepts in this course? (Major topics)
It is important for the trainer to identify 5-7 major key-ideas, topics, or themes in the course. Place them in an appropriate sequence and create a thematic structure (units) for the course.
- Pedagogical basis and theory of the course
- What are the major key-ideas of your course?
- Sort the main topics into a chronological order.
- Present your main topics using a directed flow graph.

h. What is the overall structure of the course? (Instructional strategy)
Tutor should consider the following:
- What activities need to come first?
- How should the course begin, with face to face or distant activities?
- Which should be the sequence of activities in the middle of the course - e.g. self-assessment test?
- What activities do you want to conclude with, i.e. how should the course end? Describe or list a focusing event or attention grabber that will motivate your learner to want to pay attention and learn about what you plan to study. This will depend on learner's interests and backgrounds. List or describe ways in which you can wrap up a lesson. This can include telling the learner the most important concepts which were covered in the module/course, asking them what they thought were the key concepts (or what they learned), or preparing them for the next module building upon what was presented. The key is to leave your learner with an imprint of what you hoped to achieve in any given lesson.
- **Induction meeting.** A face to face meeting about the course goals and content, and the supporting materials.
- **Learning material.** To be used by the student distantly or in presence, covering a specific Training module.
- **Knowledge assessment test.** It could be a quiz or a crossword, or even an activity/assignment that the students have to do and/or submit to their tutors, could be executed online.
- **Case study – Project.** Students working in groups or on their own deal with practical situations.
- **Simple questionnaire.** Used at mid-point and at the end, seeking student feedback on the course and its delivery.
- **Final meeting.** A face to face meeting about the course completion targeting to unravel possible student’s questions and/or misunderstandings. And also to guide the students to future learning needs.

i. **What will the learners need to do? (Learning Activities)**
   Identify the specific learning activities in a particular sequence (e.g. look/do, read, hear/talk, write, search/research, study/do, cooperate/group do, feedback) usually laid out over a span time (e.g. 1-3 week). Each learning activity could plan for face to face or and distant learner’s elaboration. List or describe ways in which you will provide opportunities for your learner to practice what you want them to learn. The more opportunities you provide, the better chance they have to master the expected outcomes.

j. **What will be the courses’ supporting tools?**
   Apart from the course content you need a series of supporting tools for the delivery of the courses. It is possible that some of the tools could also be used in the learning process (e.g. Chat), therefore there is a need to clearly distinguish between the use of a tool in any case. Set of on-line tools can be as follows: Forum, Chat, Wikis, Blog, Messages, Notice Boards, Calendar for tutors and participants.

k. **Are there enough human resources? (human resources)**
   In general, the course is mainly the collaboration outcome of four (4) groups that are sharing distinguishable roles: (a) **Administrator:** administrates and manages the electronic platform that is used to make available the educational material. Ensures the availability of computer’s resources, applies policies of safety, monitoring the backups etc. (b) **Expert of domain/content:** develops the educational material using authoring tools and follows suitable models for course description (c) **Tutor/Trainer:** delivers the educational material through face to face and distant learning sessions. Collaborates with course creators during the development of educational material. (d) **Learners:** The participants who attend the course.

l. **How will you know how the course is going? How it went? (Evaluation)**
   What kinds of feedback will you need? List or describe ways that you will check for understanding. Assessment and ongoing feedback are necessary for monitoring progress. This can include questioning, conferencing, or journal writing/reflection writing.
   - Define the degree of achievement of the course objectives.
   - Are the proposed activities effective enough or do they have to be changed?
   - Is the interaction among tutors and learners effective enough?
Are the learners satisfied with the way of teaching?
List a set of ways that may be used for feedback and evaluation:
- Quick Assessment: You may ask your learners (online or offline) about a simple question. For example, you may ask them about what is the most important issue that they have learned in the session.
- Post-questionnaire: An online or offline questionnaire (quiz, crossword, fill in the blanks etc.) that is addressed to the learners trying to record the knowledge that raised up after the course.
- Outside observers: Try to ask someone that is not involved into the design of the course.
- Learner’s interview: You may think about using online interviews. The learners may take interviews each other as well.
- Video recording: You may record some class sections in order to study the class behaviour later.

5.6. Bibliography for the methodology

2. https://www.wabisabilearning.com/blog/5-blended-learning-strategies (December 2018)
6. Components and organisation of the Syllabus

The course was divided into three essential components, called Modules, which are sub-divided into different Sections with different weight. Each section includes:

- ✓ Performance criteria, that describe competent performance required.
- ✓ Related knowledge and understanding that the Building Diagnosis Expert must have.
- ✓ Scope or range definitions of the situations the Building Diagnosis Expert must be competent to deal with.

At the beginning of each chapter, there is a short presentation of the aim and purpose of the Module and of the different Sections. The latter follow a standard format:

- ✓ Unit title
- ✓ Credit value
- ✓ Guided learning hours
- ✓ Performance Criteria
- ✓ Knowledge and Understanding
- ✓ Scope

In order to demonstrate competence in a particular Section or throughout a whole Module, candidates must show they can meet all performance criteria across the scope or range of situations and have all the required knowledge and understanding.

The syllabus contains a reading list of relevant books and articles that are compulsory or optional for students to read.
The Indicative Syllabus for Building Diagnosis Expert is presented as follows:

### Module 1. General subjects (36 / 72 hours)

The objective of this general module is introducing to the Building Diagnosis Expert the essential elements that the diagnosis requires. In order to do that, it will concern the methodological aspects for the inspection and the evaluation of buildings, it will develop knowledge about the behaviour and the pathology of materials and at the same time it will perform the social and communication skills necessary for the professional work.

#### Section 1.1 Introduction

This introductory section aims to put in value the importance of the rehabilitation of the building stock from different sides, e.g. social, environmental, heritage, economical etc. Moreover, it aims to emphasize the fact that before the process of rehabilitation it is essential to realize a diagnosis in order to know the building, its components and its state of conservation. The module presents also the methodology that will allow to face rigorously the diagnosis process, establishing steps and procedures to get closer from the whole to the detail.

#### Section 1.2 Materials behaviour & Pathology

This section introduces to the physical-chemical behaviour of building materials, focusing on the changes and sequences of the pathological processes. It will analyse and understand the effects of water, heat, physical-mechanical effects such as deformation, creep or fatigue under charge among the others.

#### Section 1.3 Soft and general technical skills

This section will focus on the personal skills that the Building Diagnosis Expert must develop with the purpose to valorise their professional work. It means from the social relations with customers, users and local administrations to the organization and the coordination of working teams, leadership and management of conflicts, or abilities to communicate orally as well as in writing.
Section 1.4 Final reports

The whole diagnosis process ends with a final document that must be precise as in the language as in the conclusions. This document must reflect the impartiality and the professional ethics of the Building Diagnosis Expert in relation to the involved subjects. This section focuses on the editing of specific documents, which may have various purposes: from the evaluation of damage to the complete diagnosis of a building as a previous step for its rehabilitation. This brings us to different documents such as reports, judgments, certificates etc.
Module 1 General subjects
Section 1.1 Introduction

Expected time of training 4/8 hours

This introductory Section aims to put in value the importance of building stock rehabilitation from different sides, e.g. social, environmental, heritage, economical etc. Moreover, it aims to emphasize the fact that before the process of rehabilitation it is essential to realize a diagnosis in order to know the building, its components and its state of conservation. The module presents also the methodology that will allow to face rigorously the diagnosis process, establishing steps and procedures to get closer from the whole to the detail.

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<thead>
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<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
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</thead>
</table>
| Level 6 according to the EQF classification Those of the degree in architecture, technical architecture or building engineering. No specific prior knowledge is required, only interest for the intervention in existing buildings. | B1. Knowledge
- To recognize the social, economic, cultural and technical context in which the diagnosis of buildings is developed, to take it into consideration in the performance of diagnostic work.
- To explain the overall process of rehabilitation of the buildings and the context in which the diagnosis of them is developed.
- To interpret the diagnosis phase as a previous and necessary stage to the rehabilitation project, with great impact on the correct execution of the works.
- Identify the costs of the diagnosis. | The collaboration of external experts is not required. |
| B2. Skills
To apply an organized and precise work methodology that guides the expert in the different stages to follow in the diagnosis processes of the buildings. | Tools and support equipment:
No support tools are required |
### B3. Competences
To discuss the importance of diagnosis in any rehabilitation process.

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Lectures (80%/total amount)</th>
<th>Exercises (%/total amount)</th>
<th>Projects (%/total amount)</th>
<th>Laboratory (%/total amount)</th>
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| Assessment methods | Continuous evaluation – presence and activity during classes | Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent. |

<table>
<thead>
<tr>
<th>Bibliography</th>
<th>Main bibliography:</th>
</tr>
</thead>
</table>
| (each partner presented its own bibliography) | • Więcek, B., & Strąkowski, R. (2013). Ilościowe aspekty zastosowania termowizji w budownictwie. *Inżynier budownictwa dodatek specjalny*.  
• Tomasz, B. (2012). Trwałość budynków i budowli. Wrocław. DWE.  
• AENOR (2009). UNE 41805-1 IN Diagnostico de edificios. 1 |
Generalidades.

Complementary bibliography:

- Hoła, J., & Schabowicz, K. Nieniszcząca diagnostyka obiektów budowlanych. Przegląd wybranych najnowszych metod z przykładami zastosowań, 56, 189.
- Casanovas, X & altri (2018). Por un cambio en las políticas públicas de fomento de la rehabilitación residencial: Los municipios, pieza clave en un marco de cooperación institucional.
- Oriol Nel·lo & altri (2009). Llei de Barris, una apost a col·lectiva per la
cohesió social.

Module 1 General subjects
Section 1.2 Behaviour of construction materials and building systems: pathology

This Section introduces the physical-chemical behaviour of materials and building systems emphasizing on changes and sequences of pathological processes. The effects of water, heat, physical-mechanical effects such as tensile strain, fatigue and wear under stress, among others, will be analysed and understood.

<table>
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<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B1. Knowledge</td>
<td>C</td>
</tr>
<tr>
<td>Notions of chemistry, physics and mechanics.</td>
<td>To define and identify different concepts regarding pathological processes.</td>
<td>Laboratories for the characterization of pathological materials and processes.</td>
</tr>
<tr>
<td>Physical and chemical aspects of matter.</td>
<td>To describe and discuss the pathological processes associated with water and its effects on materials, considering the porous structure and water transport.</td>
<td>Experts in materials (materials engineers, chemists, geologists, etc.).</td>
</tr>
<tr>
<td>Characteristics, benefits and uses of construction materials.</td>
<td>To describe and discuss the pathological processes associated with stress-strain behaviour induced stress, second order effects, etc.</td>
<td>Specific regulations of materials and construction systems.</td>
</tr>
<tr>
<td>Normative Technical reference.</td>
<td>To describe and discuss the pathological processes associated with the variation of temperature and its effects, cyclic processes and exhaustion by fatigue.</td>
<td></td>
</tr>
<tr>
<td>Common constructive solutions.</td>
<td>To explain and interpret breaks of different types of materials under different actions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To define and interpret the processes of change in soils, deformation processes, water effects, thrusts, etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To describe and interpret the pathology of conglomerates according to their behaviour against different chemical, mechanical, physical, etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To describe and interpret the pathology of stone and ceramic materials according to their behaviour against different chemical, mechanical, physical, etc.</td>
<td></td>
</tr>
</tbody>
</table>
• To describe and interpret the pathology of metal materials according to their behaviour against oxidation-corrosion processes, embrittlement, corrosion under tension, etc.
• To describe and interpret the pathology of woods (lignocellulosic materials) according to their behaviour against different biotic, chemical, mechanical aggressions, etc.
• To describe and interpret pathological processes associated with the toxicity of materials, their volatile compounds, the radiation emitted the biological presence of pathogens, etc.
• To identify and estimate complex pathological processes (synergistic) in different constructive solutions, compatibility and incompatibility of materials.

B2. Skills
• To use correctly the terminology associated with pathological processes.
• To analyse and discuss various pathological processes related to materials and construction systems subjected to various actions.

B3. Competences
• To develop hypothesis of causes from symptomatic tables and initial data.

Methodology
(general methodology from chapter 5 applies, here - details for the section of the module)

<table>
<thead>
<tr>
<th>Lectures (80%/total amount)</th>
<th>Exercises (%/total amount)</th>
<th>Projects (%/total amount)</th>
<th>Laboratory (%/total amount)</th>
<th>Site visits (%/total amount)</th>
<th>Case studies (20%/total amount)</th>
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</thead>
</table>
### Assessment methods

- **Continuous evaluation** – presence and activity during classes
- **Report on conducted research and / or presentation**
- **Trainee assessment**: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.

### Bibliography

(Each partner presented its own bibliography)

#### Main bibliography:

#### Complementary bibliography:

Module 1 General subjects
Section 1.3 Construction history and documentation

Expected time of training 12/24 hours

This Section will develop knowledge of the history of construction for the identification and recognition of the constructive systems and materials used throughout history, always in a local context. Likewise, skills will be acquired in the search and management of archival documentation related to buildings, and in the analysis of the building itself as an information element. The necessary knowledge will be acquired to understand the building, its construction systems and identify its heritage values.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own A</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training B</th>
<th>External support: tools and experts C</th>
</tr>
</thead>
<tbody>
<tr>
<td>General culture and historical framework in the European architectural context.</td>
<td>B1. Knowledge • To recognize the history of architecture, in different periods, in the local context. • To identify and define the historical construction with precision, regarding the materials and construction systems used in the different historical moments. • To differentiate and classify the materials and construction systems presented by the buildings, and relate them to their time of construction. • To recognize the building as a document and source of information. • To interpret the archival documentation in the study of the evolution of buildings. • To understand the difference between destructive and non-destructive testing in both Historical Buildings and existing buildings. • To understand the potential of the application of Internet of Things (IoT) and Key Enabling Technologies (KETs) such as sensors in order to realize a real-time monitoring of the buildings state of maintenance.</td>
<td>Experts in the study of buildings and their components, both in the building itself and in archives (archaeologists, historians, documentarists, etc.) Experts/laboratories in destructive and non-destructive testing</td>
</tr>
</tbody>
</table>
### B2. Skills
- To deduct the history and evolution of buildings, based on their knowledge and analysis.
- To apply patrimonial sensitivity, to identify and appreciate the architectural, historical - artistic and memory values of the building as a whole and / or its components.
- To use the bibliography, archives and documentation centers correctly.
- To define a first draft of diagnosis project priorities in order to verify historical evolution of the building.

**Tools and support equipment:**
- Archival funds, manuals, best practices, photographic survey.

### B3. Competences
- To arguing the architectural and historical aspects of buildings and their components.

### Methodology
(general methodology from chapter 5 applies, here - details for the section of the module)

<table>
<thead>
<tr>
<th>Lectures (60%/total amount)</th>
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<tbody>
<tr>
<td>Exercises (%/total amount)</td>
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### Assessment methods
Continuous evaluation – presence and activity during classes
Report on conducted research and / or presentation
Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.
**Bibliography**

(each partner presented its own bibliography)

**Main bibliography:**

- Ratajczak, H. Historia technik budowlanych z elementami materiałoznawstwa 1402-HTB-2L-N1.
- AENOR (2009). UNE 41805-2 IN Diagnostico de edificios. 2 *Estudios históricos*
- Heyman, J (2015) Teoría, historia y restauración de Estructuras de Fábrica Vol I y II

**Complementary bibliography:**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosell, J. (2010)</td>
<td>La construcció en l'arquitectura de Barcelona a finals del segle XVIII.</td>
</tr>
<tr>
<td>Rosselló M. (2005)</td>
<td>L'interior a Barcelona en el segle XIX</td>
</tr>
<tr>
<td>RICS Practice Standard (2018)</td>
<td>Surveying Safely, RICS</td>
</tr>
</tbody>
</table>
Module 1 General subjects

Section 1.4 Final reports

Expected time of training 4/8 hours

Every diagnostic process ends in a final document that must be precise both in the language and in the conclusions. It has to be a document that must reflect the impartiality and professional ethics of the Building Diagnosis Expert with all the parties involved. This Section focuses on the writing of specific documents, which may have different objectives: from a specific damage assessment to the complete diagnosis of a building as a step prior to its rehabilitation. This leads us to different documents such as reports, judgements, certificates or others.

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<td>B</td>
<td>C</td>
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</table>
| To have the ability to write technical reports related to the building sector. To master the technical vocabulary related to construction and pathology. To have knowledge of computer programs type "office", at user level. | B1. Knowledge
- To understand the need to adopt an ethical behaviour and a position of impartiality in the exposed opinions, before a conflict of interests.
- Ability to add and discuss all the information collected during the diagnosis process and to draw clear and precise conclusions.
- Ability to write the resulting documents adjusted to the language of the profile of the recipient of the document (technician or user).
- To differentiate the various types of documents that may result from a diagnosis process, depending on your objectives. They can be reports, opinions, certificates, ITEs, certificates of habitability or energy, etc., or complete diagnoses prior to the drafting of a rehabilitation project.
- To identify risk situations and design emergency measures to alleviate it. | The collaboration of external experts is not required for the writing of the reports, although their collaboration may have taken place in the phase of data collection and analysis of some components of the study. |
| B2. Skills
- To write, illustrate and present orally, a general and detailed view of the evaluation carried out during the diagnosis, with a precise... |
language, both in the description of the constructive elements and in the assessment of their status.
- To use graphic expression tools, image processing and infographic representation.

### B3. Competences

- To record all the process carried out, all the methodologies and data obtained and the reflections made throughout the diagnosis.
- To synthesize and evaluate the information collected during the diagnosis process, and draw clear and precise conclusions regarding the initial objective of evaluating a pathological process or a complete building. Generate the diagnosis.
- To draft general recommendations for intervention and emergency measures.

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<td>• Area Tècnica del CAATEEB (2015). Criteris per a la redacció: informes, certificats, peritatges i dictàmens. Barcelona, España: <em>Col·legi d’Aparelladors, Arquitectes Tècnics i Enginyers d’Edificació de Barcelona</em>.</td>
</tr>
<tr>
<td>• AENOR (2010). <em>UNE 41805-14 IN. Diagnóstico de edificios. 14: Informe del diagnóstico</em>.</td>
</tr>
</tbody>
</table>

**Complementary bibliography:**

| RICS Practice Standards (2010) Building surveys and technical due diligence of commercial property *UK 4th edition, guidance note, RICS* |
Module 2. Instrumental complements for diagnosis (38 / 76 hours)

The aim of this module is the presentation and the development of resources that the Diagnosis expert requires to realize the diagnosis processes: historical and documentary knowledge of the buildings, legal and normative frame, past and actual regulations, graphic survey, building modelling systems and other generic tools, all necessary to realize a complete, reliable, high quality diagnosis.

**Section 2.1 Construction history and documentation**

This section develops knowledge of the Construction History for the identification and recognition of the constructive systems and the employed materials during history, always in a local context. Moreover, it will provide skills for research and management of archival documents related to the buildings and for the analysis of the building as a proper source of information. It will provide necessary knowledge to understand the building, its constructive systems and to identify its heritage values.

**Section 2.2 Legal and regulatory framework**

This section is oriented towards the identification of the legal requirements and the performance needs that affect the buildings and their components (European directives and national and local normative). Moreover, it will deepen the historical legal frame in order to contextualize the buildings and their performances in relation to the necessities required in the moment of the construction.

**Section 2.3 Survey Modelling (BIM)**

This Section deals with the application of new skills and strategies for process management as well as the introduction of new integrated technologies to support both productivity and innovation through the construction sector digitization. Regarding diagnosis for the intervention (preservation as well as renovation) on existing buildings, those skills are strictly related to the present possibility of data acquisition, data extraction, analysis and representation into a unique parametric 3D model (platform).

**Section 2.4 Building inspection, tools and auxiliary techniques**

This section will provide the directives for the organization and the management of inspection in buildings. It will go into details of the collection and processing of data and the management of information in order to get successful results. Moreover, it will present the tools and the equipment within Diagnosis expert’s reach, with which he/she may improve the quality and the precision of the required information, from the most basic always at his/her reach, to the most complex, which might require the collaboration of external experts.
Module 2 Instrumental complements
Section 2.1 Social and transversal skills

This Section will work with the personal skills that a Building Diagnosis Expert must develop for his professional practice: from social relationships with clients, users and local administrations, to the organization and coordination of work groups, leadership and conflict management, or their ability to communicate both orally and in writing.

<table>
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<tr>
<td>A</td>
<td>B1. Knowledge</td>
<td>C</td>
</tr>
</tbody>
</table>
| Sensitivity towards the possible contributions of the interlocutors. | • Communication and professional ethics.  
  - To define ethical principles for all professional actions.  
  - To interpret the contributions of the interlocutor and adapt to it.  
  - To manage communication and empathy to give clear and adequate information to the circumstances.  
  - To describe different socio-cultural areas to avoid any discrimination by culture, gender or beliefs.  

• Conflict resolution  
  - To discuss an action strategy among multiple alternatives, evaluating participation and responsibilities.  

• Teamwork and leadership  
  - To define effective communication with the working group.  
  - To set an example with a proactive role in the group.  
  - To discuss decision making (listening, analysis, synthesis).  
  - To interpret the nature of the problems, seek solutions and shared results.  
  - To describe the ability to "negotiate".  
  - To recognize conflict and crisis management.  

• Planning and organization  
  - To define the work plan. | Managers of public buildings parks.  
Professionals of the real estate administration.  
Social workers, socio-cultural animators, etc. |
B2. Skills

- To use a communication adjusted to the different interlocutors, from professional ethics.
- To apply leadership and teamwork.
- To organize work plans according to the needs of the inspections.
- To establish safety and health measures adapted to each case.
- To use correctly the bibliography and related legal regulations.
- To promote and communicate sustainability as key component in project management and production/intervention processes for a rational use of resources and a low-impact development.

B3. Competences

- To contrast and correctly interpret the relationships with the social agents involved and with the work team itself.
- To formulate and generate work plans considering the organizational needs of safety and health regulations.
- To present intervention plans and sectoral projects to multistakeholders' groups (public stakeholders, private and citizens) in order to increase general awareness regarding the importance of diagnosis resilience, safety, security and comfort of buildings and stimulate stakeholders engagement.
<table>
<thead>
<tr>
<th>Methodology</th>
<th>Lectures (50%/total amount)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Exercises (%/total amount)</td>
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| Assessment methods                      | Continuous evaluation – presence and activity during classes |
|                                         | Report on conducted research and / or presentation |
|                                         | Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent. |

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<th>Main bibliography:</th>
</tr>
</thead>
</table>

|                                         | Complementary bibliography: |
Module 2 Instrumental complements  
Section 2.2 Legal and regulatory framework  

This Section aims at identifying the legal and provision of services regulations that affect buildings and their components (European directives and national and local regulations), as well as aspects of professional civil responsibility. It will also take into account the evolution of the legal framework in time to contextualize buildings and their provision of services in relation to the demands required at the time of their construction. On the other hand, there will be a critical reflection on regulations and their objectives.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
</table>
| A                                        | B1. Knowledge  
To interpret the normative frame of reference in the field of Building Rehabilitation (European, national, regional and local).  
- To recognize and adapt the legislation and regulations applicable to existing buildings according to historical and technological conditions.  
- To define the technical regulations applicable to current and historical construction materials and systems.  
- To interpret the regulations on environmental protection and apply it to building diagnosis processes.  

B2. Skills  
- To use the legal and regulatory framework applicable in each case, in a precise and adjusted to the environment, in any process of diagnosis.  
- To analyse and correctly apply the legal regulations and resort to the related bibliography. | C  
Experts in legislation applied to the construction sector. |
| **Methodology**  
| (general methodology from chapter 5 applies, here - details for the section of the module) | Lectures (80%/total amount)  
| Exercises (%/total amount)  
| Projects (%/total amount)  
| Laboratory (%/total amount)  
| Site visits (%/total amount)  
| Case studies (20%/total amount) |
| **Bibliography**  
| (each partner presented its own bibliography) | Main bibliography:  
| DM 560/2017, Decreto per la digitalizzazione degli appalti pubblici  
| Norma UNI 11337:2017  
| Normativa Española: https://www.fomento.gob.es/arquitectura-vivienda-y-suelo/normativa (08/07/2019) |
Complementary bibliography:

This Section deals with the application of new skills and strategies for process management as well as the introduction of new integrated technologies to support both productivity and innovation through the construction sector digitization. Regarding diagnosis for the intervention (preservation as well as renovation) on existing buildings, those skills are strictly related to the present possibility of data acquisition, data extraction, analysis and representation into a unique parametric 3D model (platform).

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>- the construction process.</td>
<td>• To recognize survey methods (traditional and with new technologies)</td>
<td></td>
</tr>
<tr>
<td>- graphic survey techniques and tools.</td>
<td>• To describe the criteria of graphic representation in diagnostic work.</td>
<td></td>
</tr>
<tr>
<td>- diagnostic techniques and methods and data acquisition tools.</td>
<td>• To recognize diagnostic methods with integrated digital data management technology to implement a BIM model.</td>
<td></td>
</tr>
<tr>
<td>- computer aided design applications for the construction sector.</td>
<td>• To interpret BIM standards.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To recognize the BIM method, tools and formats.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To compare the BIM level of details and the level of development in relation to the objective of the model.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To recognize international, European and national regulations and standards, with reference to the digitization of the construction industry and the application of BIM.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Identify the consequences, barriers and opportunities, in the medium and long term, related to the introduction of the BIM standards.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2. Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To organize and solve processes of graphic survey of buildings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To use design software, 3D surveys and BIM modelling.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To apply studies and good practices in the field of BIM modelling.</td>
<td></td>
</tr>
</tbody>
</table>
for the diagnosis, projects and management of existing buildings.

**Tools and support equipment:**
UNI standards, BIM software for architectural authoring

**B3. Competences**
- To create graphic representation of the buildings surveys
- To develop hypotheses and interpret BIM models for the diagnosis stage.

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Lectures (50%/total amount)</th>
<th>Exercises (50%/total amount)</th>
<th>Projects (%/total amount)</th>
<th>Laboratory (%/total amount)</th>
<th>Site visits (%/total amount)</th>
<th>Case studies (%/total amount)</th>
</tr>
</thead>
</table>

**Assessment methods**
Continuous evaluation – presence and activity during classes
Report on conducted research and / or presentation
Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.

**Bibliography**
(each partner presented its own bibliography)

**Main bibliography:**
<table>
<thead>
<tr>
<th>Warszawa.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• UNI 11337 (2019), Gestione digitale dei processi informativi delle costruzioni.</td>
</tr>
<tr>
<td>• Maestre López-Salazar, R.; Irles, F. Levantamiento de planos de fachadas a partir de una fotografía.</td>
</tr>
</tbody>
</table>

**Complementary bibliography:**

| • Ustinovicius, L., Wierzowiecki, P., & Puzinas, A. Modelowanie informacyjne budowli (BIM)–stan rozwoju i perspektywy wdrażania w Polsce. *Innowacje w zarządzaniu i inżynierii produkcji, 1.* |
| | - P Barnes (2019) *BIM in Principle and in Practice*, *ICE*  
Module 2 Instrumental complements

Section 2.4 Building inspection, tools and auxiliary techniques

Expected time of training 14/28 hours

This Section will provide the guidelines for the building inspection organization and management. Details on the collection and processing of data and the information management will be included to obtain successful results. Likewise, the instruments and equipment available to the Building Diagnosis Expert will be presented, with which the expert can improve the quality and accuracy of the required information, from the most basic, always available to the expert, to the most complex which can require the collaboration of external experts.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Characteristics of common construction</td>
<td>• To identify and discuss methodologies for conducting surveys and / or</td>
<td>Experts in materials,</td>
</tr>
<tr>
<td>materials and systems.</td>
<td>interviews with users, maintenance managers, managers of built parks, etc.</td>
<td>machinery and testing</td>
</tr>
<tr>
<td>Behaviour and use of buildings.</td>
<td>(intended for taking data on use, observed dysfunctions, the age of the</td>
<td>mechanisms.</td>
</tr>
<tr>
<td></td>
<td>injuries, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify and discuss building inspection methodologies, prospecting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>techniques, sampling criteria and representativeness.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To recognize, discuss and interpret symptoms and injuries.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To recognize, discuss and interpret non-destructive testing (NDT) and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;in situ&quot; testing as inspection support tools.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To recognize, discuss and request the necessary aid from specialized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>companies (construction companies, accessibility, etc.) and laboratories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(geotechnics, materials, acoustics, fire, biological, etc.), as well as</td>
<td></td>
</tr>
<tr>
<td></td>
<td>training for the interpretation of the results obtained.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To interpret the results obtained in the inspection. Generalization of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>results.</td>
<td></td>
</tr>
<tr>
<td>B2. Skills</td>
<td>• To identify, choose and apply different techniques and tools for the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>characterization of materials.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify, choose and apply different techniques and tools for the</td>
<td></td>
</tr>
</tbody>
</table>
geometric verification of constructive elements.

- To choose and correctly use different measuring instruments to assess various parameters.
- To choose and organize auxiliary equipment and tools for inspection. Tasting campaigns, sampling, testing "in situ", etc.
- To use combined systems of diverse tests (END, etc.).
- To correlating different techniques of obtaining data.
- To communicate with diverse interlocutors getting and transmitting information in a tight and precise way.

**Tools and support equipment:**

Diagnosis expert Tools Box

### B3. Competences

- To direct, organize and execute the inspection process.
- To understand and conclude the results of the inspection.

<table>
<thead>
<tr>
<th>Methodology (general methodology from chapter 5 applies, here - details for the section of the module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures (80%/total amount)</td>
</tr>
<tr>
<td>Exercises (%/total amount)</td>
</tr>
<tr>
<td>Projects (%/total amount)</td>
</tr>
<tr>
<td>Laboratory (%/total amount)</td>
</tr>
<tr>
<td>Site visits (%/total amount)</td>
</tr>
<tr>
<td>Case studies (20%/total amount)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous evaluation – presence and activity during classes</td>
</tr>
<tr>
<td>Report on conducted research and / or presentation</td>
</tr>
<tr>
<td>Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.</td>
</tr>
<tr>
<td>Bibliography</td>
</tr>
<tr>
<td>----------------------------------</td>
</tr>
</tbody>
</table>
  • Dì Giulio, R. (2003), Manuale di manutenzione edilizia: valutazione del degrado e programmazione della manutenzione. Rimini, Italia: Maggioli  
Module 3. Analysis elements (76 / 152 hours)

The purpose of this module is deepening the analysis of all the components of a building and the evaluation of its global behaviour, and its capacity to respond to the demanded performances. The analysis and the evaluation will be provided considering the structural security, the habitability and the comfort, energetic efficiency, noise protection, the accessibility, the environmental quality and all the parameters that are considered appropriate to achieve a high quality diagnosis.

Section 3.1 Social framework

An integral diagnosis must contemplate social matters affecting the use and the maintenance of the buildings. In this section, we introduce concepts such as the immigration, the gentrification and the difficulties and necessities of different profiles of users, of administrators of consistent building stock, etc.

Section 3.2 Structural safety

This section will develop the analysis of the structure in its entirety and of the various structural subsystems following an iterative process starting from the obtaining of information about performances and structural survey. The results obtained during the whole process will allow to evaluate the global behaviour of the structure of the building and to identify the elements needing rehabilitation works.

Section 3.3 Energy efficiency

In this section, we will develop the analysis of the building in its totality and of the different building elements forming its closings and their capacity to answer the present exigencies in terms of energetic demand. It will also analyse the cooling and heating, hot water, ventilation and lighting in terms of energy efficiency and proven benefits. The obtained results of the whole process will allow to evaluate and to satisfy the energetic efficiency of the building.

Section 3.4 Habitability and comfort

In this section, we will develop the analysis of the building in its totality and of the different building elements forming its closings and its performances for the habitability, the comfort and the healthiness of its users, following an iterative process starting from the acquisition of performance data. The obtained results of the whole process will allow to evaluate and to satisfy the performances of habitability, comfort and healthiness of the building.
Section 3.5 Safety in use
This section will develop the analysis of the building and the various constructive elements that affect the safety in use, the accessibility and all the services, following an iterative process starting from obtaining performing information. The results obtained during the whole process will allow to make an evaluation and an accomplishment of security performances related to the use of the building, as well as the accomplishment of the regulation related to the use.
Module 3 Analysis elements

Section 3.1 Social framework

Expected time of training 6/12 hours

An integral diagnosis should include social issues that affect the use and maintenance of buildings. In this section sociodemographic, socio-economic and socio-spatial concepts such as the immigration, gentrification, vulnerability or energy poverty are introduced. The difficulties and needs of the different figures will also be identified: communities, user profiles, administrators of large building stock, real estate managers and/or property administrators.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B1. Knowledge</td>
<td></td>
</tr>
<tr>
<td>Basic concepts about housing policies.</td>
<td>• To identify social conditions that affect the use, habitability and comfort in buildings.</td>
<td>Social agents, professionals in the health and health sector</td>
</tr>
<tr>
<td>Basic concepts of health, welfare and risks related to habitability in buildings.</td>
<td>• To identify sources of information and previous work as support documentation.</td>
<td>Material characterization laboratory</td>
</tr>
<tr>
<td>Mastery of terminology and the basic language of economics, sociology and multiculturalism.</td>
<td>• To define key socio-demographic, socio-economic and socio-spatial indicators for understanding, at different scales, the state of buildings.</td>
<td>Experts in the detection of biotic agents (fungi, bacteria, parasites and other infectious or contagious diseases)</td>
</tr>
<tr>
<td>Professional ethics</td>
<td>B2. Skills</td>
<td>Experts in detection of environmental pollutants</td>
</tr>
<tr>
<td></td>
<td>• To document the current state of buildings in relation to the use, occupation, maintenance, property regime, urban and sociological environment.</td>
<td>Laboratories and tooling for sampling and analysis of environmental contaminants</td>
</tr>
<tr>
<td></td>
<td>• To use already existing socio-demographic, socio-economic and socio-spatial indicators.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To use simple documentation management tools, data processing and infographic development.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To choose the appropriate formats (surveys, interviews, files and other tools of the social sciences) for the methodological collection</td>
<td></td>
</tr>
</tbody>
</table>
of social data

**Tools and support equipment:**
- Small tools for gas verification in smoke outlets, sound level meters, hygrometers, thermographic cameras, photography machine, endoscope, ammeters, luxmeters.
- Tools for sampling and analysis of environmental contaminants
- Surveys, cards and other social science tools for data collection.

**B3. Competences**
- To estimate the needs, characteristics, shortcomings and economic, cultural and social limitations of the communities occupying buildings.
- To design "ad hoc" methodologies for sociodemographic, socio-economic and socio-spatial inspection of buildings.
- To develop methodologies and protocols for the characterization, location and evaluation of vulnerable areas.

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Lectures (60%/total amount)</th>
<th>Exercices (30%/total amount)</th>
<th>Projects (%/total amount)</th>
<th>Laboratory (%/total amount)</th>
<th>Site visits (%/total amount)</th>
<th>Case studies (10%/total amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(general methodology from chapter 5 applies, here - details for the section of the module)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Assessment methods**
- Continuous evaluation – presence and activity during classes
- Report on conducted research and / or presentation
- Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.
**Bibliography**

(each partner presented its own bibliography)

**Main bibliography:**


**Complementary bibliography:**

# Module 3 Analysis elements
## Section 3.2 Habitability and comfort

This section provides the basis for analyzing buildings as a whole following an iterative process, and from obtaining provision of services information of the different construction elements that make up their enclosures, as well as the services and facilities that affect the habitability, comfort and healthiness of its users. The results obtained throughout the whole process will allow the assessment and verification of compliance with the building’s habitability, comfort and health provision of services.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
</table>
| A                                        | B1. Knowledge  
- To relate the properties and chemistry of the materials with the issues of health, health, environmental pollution.  
- To recognize environmental criteria: thermal comfort, relative humidity, air renewal, lighting, noise and vibrations.  
- To identify the appropriate equipment for taking measurements and tests | Experts in Industrial Engineering, identification recognition and performance evaluation of systems of facilities |
| Administrative documents for the evaluation of the existing building  
Basic concepts of physics: fluid dynamics (heat, humidity, air circulation), acoustics, hygroscopicity and environmental indicators  
- To apply methodology for the inspection of buildings. Data collection (Architecture, construction, dynamics of use, systems and installations)  
- To determine the key health concepts to be analysed: risk of water presence and humidity; Collection and disposal of waste; indoor air quality and ventilation; quality of drinking water supply; hygienic equipment; water evacuation.  
- To determine the key acoustic concepts to analyze: limit values of reverberation, noise and vibrations.  
- To use simple tools and small tools for the evaluation of environmental and habitability parameters: verification of gases in fume outlets, luxometers, sound level meters, hygrometers, thermographic cameras, photographic machines, endoscopes, ammeters, etc. | Experts in insulation and acoustic conditioning  
Experts in Bioengineering and measurement of waves, radiation, electromagnetic networks and other pollutants.  
Social agents  
Laboratories and... |
- To manipulate simulation and evaluation programs (lighting, condensation, reverberation, etc.)
- To analyse the current state of buildings based on available documentation, visual inspection and evaluation bases (domestic hot water, heating, cooling, lighting and equipment, acoustic conditions, tightness, humidity and their origin, air quality, contaminants)
- To determine the current state of buildings from an iterative process of identification, analysis and determination of environmental dysfunctions and / or affecting health and comfort.

**Tools and support equipment:**
- Energy, lighting, environmental, interstitial condensation, reverberation, etc. simulation and evaluation programs.
- Small tools for gas verification in smoke outlets, luxmeter, sound level meters, hygrometers, thermographic cameras, photography machine, endoscope, ammeters

**B3. Competences**
- To relate social conditions with habitability and comfort in buildings
- To interpret a plan for research and analysis of environmental contaminants.
- To evaluate the state of a building in terms of its habitability benefits.
- To assess serious and / or extreme situations and propose emergency measures.
- To evaluate different sampling systems and decide on criteria for a research plan for environmental quality and sanitation

**Methodology**
(general methodology from chapter 5 applies, here - details for the section of the module)
- Lectures (30%/total amount)
- Exercises (20%/total amount)
- Projects (%/total amount)
- Laboratory (30%/total amount)
- Site visits (%/total amount)
- Case studies (20%/total amount)

**tools for sampling and analysis of biotic agents and environmental pollutants**
Experts in health and identification of diseases related to habitability and environmental quality.
| Assessment methods | Continuous evaluation – presence and activity during classes  
Report on conducted research and / or presentation  
Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent. |

| Bibliography | Main bibliography: |
- Generalitat de Catalunya (2012), Decret 141/2012 sobre condicions
mínimes d'habitabilitat dels habitatges i la cèdula d'habitabilitat. Barcelona, España.

Complementary bibliography:

- Instituto nacional de Seguridad e Higiene en el Trabajo (...) El Síndrome del edificio enfermo. Madrid, España.
Module 3 Analysis elements

Section 3.3 Energy efficiency

Expected time of training 16/32 hours

This section provides the bases for analysing buildings following an iterative process, and from obtaining provision of services information of the different construction elements that make up their enclosures, as well as the services and facilities that affect the current requirements limiting demand and energy efficiency. Work will be carried out on the diagnosis of buildings’ envelope and the limitation of energy demand, and on the performance of heating, ventilation and air conditioning (HVAC), and lighting systems in terms of their energy efficiency and provision of services guarantees. The results obtained throughout the whole process will allow the assessment and verification of compliance with building’s energy efficiency.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
</table>
| Administrative documents for the evaluation of energy efficiency in existing buildings | **B1. Knowledge**  
- To relate the properties of the materials with the questions of thermal conductivity and hygroscopicity.  
- To identify the appropriate equipment for taking measurements and tests  
- To identify the energy assessment tools, simulation or calculation programs suitable for each type of diagnosis to be performed (Calener, Dialux ...)  
- To recognize the usual energy efficiency indicators for the diagnosis and energy evaluation of buildings. | Experts in energy efficiency, energy certification  
Experts in industrial engineering, identification, recognition and evaluation of the performance of systems of installations (domestic hot water, heating, cooling, ventilation, etc.) |
| Basic concepts of physics: fluid dynamics (heat, humidity, air circulation) laws of thermodynamics; electricity | | |
| Basic concepts of operation of the systems of sanitary hot water, air conditioning, lighting and ventilation | **B2. Skills**  
- To apply methodology for the inspection of buildings. Data collection (Architecture, construction, systems and installations, dynamic data, invoices, usage dynamics).  
- To determine the key concepts to analyse (thermal transmittances, thermal loads, efficiency of the equipment, comfort measures, infiltrations). | |
| Domain of terminology and technical language (Technical Building Code) | | |
To use simple tools and small tools for the evaluation of energy parameters: fluxometers, luxometers, hygrometers, thermographic cameras, photographic machines, endoscopes, ammeters, etc.
To manipulate basic programs of simulation, evaluation and energy certification.
To identify and use the appropriate equipment for taking measurements and tests.
To analyze the current state of buildings based on available documentation, visual inspection and evaluation bases (limitation of demand, envelope performance, domestic hot water systems, heating, cooling, lighting and equipment).
To determine the current state of buildings from an iterative process of identification, analysis and determination of energy dysfunctions.

Tools and support equipment:
- Energy, lighting, environmental, interstitial condensation, reverberation, etc. simulation and evaluation programs.
- Small tools for gas verification in smoke outlets, luxmeter, sound level meters, hygrometers, thermographic cameras, photography machine, endoscope, ammeters.

B3. Competences
- To relate the constructive systems of the envelope of the buildings with the benefits and the limitation of the energetic demand.
- To relate building installation systems with performance and energy efficiency.
- Interpret the results of the simulation, calculation and energy evaluation of buildings.
- To evaluate the state of a building in terms of its benefits of environmental comfort and habitability and relate it to the limitation of demand and energy efficiency.
- To assess serious and / or extreme situations and propose emergency measures.
- To evaluate different sampling systems and decide evaluation criteria for an energy certification.
| Methodology | Lectures (20%/total amount)  
(20% from total amount)  
Exercises (30%/total amount)  
Projects (30%/total amount)  
Laboratory (20%/total amount)  
Site visits (%/total amount)  
Case studies (%/total amount) |
| Assessment methods | Continuous evaluation – presence and activity during classes  
Report on conducted research and / or presentation  
Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent. |
| Bibliography | Main bibliography:  
### Complementary bibliography:

- **Golański, M. (2011). Wybór materiałów budowlanych w kontekście efektywności energetycznej i wpływu środowiskowego. Przegląd budowlany, 82(3), 76-83.**
- **Nowak, B. (2007). Energetycznie efektywne budownictwo. Rynek Instalacyjny, (10), 21-26.**
| Approved Document Part L - Conservation of fuel and power, NBS. |
Module 3 Analysis elements
Section 3.4 Structural safety

This Section will develop the structural analysis of the building as a whole, and of the different structural subsystems, following an iterative process from obtaining provision of services information and structural valuation. The results obtained throughout the whole process will allow the assessment of the building’s structural performance as a whole. The results obtained throughout the whole process will allow to assess the overall performance of the building structure and identify the elements requiring rehabilitation interventions.

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B1. Knowledge</td>
<td>C</td>
</tr>
<tr>
<td>Basic concepts of mechanics and materials resistance.</td>
<td>• To master the concepts of structural safety, limit states, safety factors, etc.</td>
<td>Experts in calculation of structures.</td>
</tr>
<tr>
<td>Structural systems and their evolution and development over time.</td>
<td>• To prospect with precise methodologies the structural elements of the buildings.</td>
<td>Laboratories and tooling for sampling and analysis of structural elements and systems</td>
</tr>
<tr>
<td>Analysis of efforts and tensions.</td>
<td>• To understand the structural behaviour of the building (isoestability, hyperstability), and express in outline the state of qualitative loads, with the help of sketches and other infographics.</td>
<td></td>
</tr>
<tr>
<td>Basic concepts of calculation.</td>
<td>• To identify and evaluate qualitatively dysfunctions associated with terrain-foundations behaviour.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify and evaluate qualitatively the dysfunctions associated with the behaviour of the horizontal structure (beams and slabs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify and evaluate qualitatively the dysfunctions associated with the behaviour of arches, vaults and domes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify and evaluate qualitatively the dysfunctions associated with the behaviour of hyperstatic structures.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify and evaluate qualitatively the dysfunctions associated with accidental situations (fire, earthquake, etc.)</td>
<td></td>
</tr>
</tbody>
</table>
## B2. Skills
- To choose and organize equipment and auxiliary tools for conducting "in situ" tests, non-destructive structural tests.
- To choose and use elementary calculation software with solvency.

**Tools and support equipment:**
Special tools for structural safety check

## B3. Competences
- To interpret, evaluate and justify the injuries related to the structural systems of buildings.
- To direct, organize and execute processes for the assessment of the structural safety of buildings based on their own knowledge or with the collaboration of experts in structural calculation.
- To draft general recommendations for intervention and emergency measures.

## Methodology
(General methodology from chapter 5 applies, here - details for the section of the module)
- Lectures (20%/total amount)
- Exercises (10%/total amount)
- Projects (20%/total amount)
- Laboratory (20%/total amount)
- Site visits (%/total amount)
- Case studies (30%/total amount)

## Assessment methods
- Continuous evaluation – presence and activity during classes
- Report on conducted research and / or presentation
- Trainee assessment: Satisfactory: correct answers range from 50 to 70 percent. Good: correct answers range from 71 to 90 percent; Very good: correct answers are more than 90 percent.
### Bibliography
(each partner presented its own bibliography)

<table>
<thead>
<tr>
<th>Main bibliography:</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Complementary bibliography:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wydawnictwa Naukowo-Techniczne, Warszawa.</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Approved Document Part A - Structure, NBS</td>
</tr>
</tbody>
</table>
Module 3 Analysis elements
Section 3.5 Safety in use

Expected time of training 8/16 hours

This section will develop the analysis of the building and of the different building elements that affect safety in use, in accessibility and in all services, following an iterative process from obtaining provision of services information. The results obtained throughout the process will allow to do the assessment and compliance of the appropriate regulations according to the building use (housing, public concurrence, high occupation, etc.)

<table>
<thead>
<tr>
<th>Previous knowledge that students must own</th>
<th>Learning objectives: knowledge, skills and competences that the students will acquire during the training</th>
<th>External support: tools and experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Administrative documents for the evaluation of the existing building</td>
<td>B1. Knowledge</td>
<td>Industrial engineers experts in management of Licenses of activities</td>
</tr>
<tr>
<td>Reference Technical Regulations</td>
<td>• To relate the properties of materials with fire behavior.</td>
<td>Fire laboratories for determination of properties in materials without documented specifications</td>
</tr>
<tr>
<td>Basic concepts of installation systems, common deficiencies, health risks</td>
<td>• To identify risks in relation to fire and its severity: calculation of risk content; risk coefficient for people; danger factor for goods; factor corresponding to the action of smoke.</td>
<td>Laboratories and tools for sampling and analysis of environmental contaminants related to the systems of facilities (chemical, biological, vibrations).</td>
</tr>
<tr>
<td>Identification of structural systems and their behaviour to fire</td>
<td>• To identify the breaches in accessibility and evacuation according to the visual inspection and the evaluation bases.</td>
<td>Experts in the use of simulation, evaluation and fire behaviour</td>
</tr>
<tr>
<td>Mastery of terminology and technical language (sectorization, risk, occupation, evacuation, fire resistance, etc. Technical Building Code)</td>
<td>• To identify the breaches of the systems of facilities according to the visual inspection and the bases of evaluation (risk by moving vehicles, by the action of lightning, etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To identify the social conditions that affect the safety and use of buildings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2. Skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To apply methodology for the inspection of buildings. Data collection (Architecture, construction, systems and installations, dynamic data, invoices, usage dynamics).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To determine the current status of the buildings in terms of their safety in case of fire from: the available documentation, the visual inspection and the evaluation bases.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To determine the degree of accessibility of a building and compliance</td>
<td></td>
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</tbody>
</table>
with regulations of safety measures according to use (occupation, slipperiness of soil, entrapment, drowning, etc.)

- To analyse the current state of the buildings regarding the security of the systems of facilities from: the available documentation, the visual inspection and the bases of evaluation.
- To manipulate small tools for the verification of gases in fume outlets, sampling tools and analysis of environmental pollutants related to the systems of installations (chemical, biological, vibrations), luxometers, etc.
- To use simulation programs for thermal load, combustibility, occupancy calculation, etc.

**Tools and support equipment:**

- Simulation programs for thermal load, combustibility, occupancy calculation, etc.
- Fire laboratory for the determination of properties in materials without documented specifications.
- Small tool for verification of gases in smoke exits, luxmeter,
- Small tools for sampling and analysis of environmental pollutants related to installation systems (chemical, biological, vibrations).

**B3. Competences**

- To assess the building’s non-compliances in terms of safety of use according to current regulations.
- To discerning the serious breaches of the minor regarding safety of use in buildings
- To design adaptation solutions for compliance with the safety of use in public buildings.
- To assess serious and / or extreme situations and propose emergency measures
## Methodology
(General methodology from chapter 5 applies, here - details for the section of the module)

<table>
<thead>
<tr>
<th>Lectures (10% / total amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises (10% / total amount)</td>
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<tr>
<td>Projects (70% / total amount)</td>
</tr>
<tr>
<td>Laboratory (10% / total amount)</td>
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<td>Site visits (% / total amount)</td>
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**Complementary bibliography:**
