



## **DELIVERABLE: D24 - D4.4**

### **E-learning Courses for Technicians**

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**Network for Using BIM to Increase the Energy Performance**

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This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.





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| A. Deliverable Details       |  |
|------------------------------|--|
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| <b>Dissemination Level:</b>  | Public   |



## B. Short description

This deliverable describes the characteristics of the developed e-learning courses in different partner's countries and could be used as a guideline to develop an e-learning platform on the same subject or can be used to access the e-learning courses developed in each partners' languages and in English.

The goal of this report is to provide an overview of the **E-learning Courses for Technicians**.

Nowadays it is possible to visualize the BIM model on a tablet. The installers and workers will need to learn how to use the BIM viewer instead of the 2D design and need also to learn how to point out the inconsistencies between the "as built" and the "as planned".

Validation of BIM Qualification Models and training materials was implemented in each partner country by the partners with more experience in training activities such as Universities and Training Centres. Mainly one partner per country organised and performed training, and these were as follows: ENEA (IT), FLC (ES), TUT (EE), FCE (HR), Dig.Con. (LT), ISSO (NL), ViaEU (SK).

E-learning contents was uploaded on the e-learning platforms (Moodle and ENEA e-learn) and were developed in national languages Croatian, Dutch, Estonian, Italian, Latvian, Slovak, Spanish. Validation of training material and assessment for **Installers and Workers** on how to use BIM for the energy performance was realised through an E-learning course.

Good quality practices of education are based on these three pillars:

- clear definitions of learning outcomes,
- design and structure of the programme course,
- evaluation and monitoring of the learning outcomes

The main goal of this report is to provide information for future activities, based on the experience during the Net-UBIEP project. Therefore, this report will present the overview of the developed e-learning courses and will set guidelines for the learning outcomes (also project deliverable *D4.8 Review of the three dimensional matrix*), the evaluation of the courses, and finally will also enable experience exchange between the different training institutions.

The report does not contain sensitive information and the collected data is being treated confidentially following the rules of General Data Protection Regulation 2016/679.

## 1. Learning outcomes and training programme

Both learning outcomes and training programme were explored and defined in details in previous project activities. All the partners followed the learning outcomes defined in deliverables *D14 - D3.1 Three-dimensional Matrix* and *D15 - D3.2 Requirement for learning outcomes* as well as the training materials developed as deliverables *D20 - D3.7 E-contents for Technicians on how to read BIM models*.

Therefore, in this chapter a summary of the main information is presented, as detailed information can be found in the respective Deliverables.

The e-learning courses followed somewhat different structure in every partner country but as mentioned before have always included all the learning outcomes and training content defined in respective deliverables. Additionally, each respective partner developed their e-learning courses at different levels of interactivity which then followed their course structure.

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### 1.1 E-learning

The term "E-learning" does not indicate that a new form of learning takes place, but rather that digital technologies are used to develop new educational practices as well as enhancing traditional educational practices.

The term can denote both the digital tools and technologies used in the student's learning process and the new practices of the teachers and students that are brought about from using these tools.

Digital tools/technologies used in E-learning may be software programs, web pages/portals/services, voting devices, etc. The new practices may be remote teaching via online conferencing, online collaboration and group work, digital exams, etc.

Whereas E-learning can refer to tools and technologies, "online teaching" refers solely to the teacher's practices of teaching using web based tools and technologies. Similarly, "online learning" means the learning process that goes on using E-learning tools on the web.

Web technologies such as blogs, forums, and wikis allow people to interact online, to exchange information, ask questions, and share knowledge with their peers. In recent years many platforms and services have sprung up that build on social interaction between the users. These are collectively known as "social media".

Some of these features, such as blog or forum functionalities, are often included in standard learning management systems to a higher or lower extent to harness the possibilities of social interaction in the learning process. Features like blogs and forums are also taken advantage of in different online learning platforms, where learners benefit from the diversity of each other's knowledge by asking and answering questions as part of their studying as described above.

Another form of online teaching activities are live webcasts, i.e. streaming video and interaction between teacher and students at different locations. This form of synchronous online learning potentially has the advantage of providing a rich and engaging learning experience. The disadvantage is that a slight disturbance in sound or image can disturb the learning process. Synchronous as well as asynchronous online learning requires of the teacher a new set of skills to function as a moderator in the online classroom. Similarly, online teaching often requires a rethinking of the pedagogical design that must be considered, alongside the choice of technology and platform, when institutions and teachers begin the endeavour into online teaching.

The benefits of E-learning programmes and courses would be that knowledge of excellence can be distributed from a small number of education institutions to a wider learning community. This learning community is not necessarily restricted to academic organizations but may also include partners from the industry. E-learning programmes and courses might be used as building blocks for continuous education and life-long learning. The flexibility turns out to be limited when workers, installers and technicians try to fit physical courses, which take place at fixed times of the day and week, into their busy working schedule. Many E-learning applications offer a new degree of flexibility where workers and installers can learn anytime and anywhere.

An e-learning course has a few levels of interactivity. These levels are characterized by the degree of intelligence created in the e-learning course. There are 4 levels of interactivities that can be used in online courses.

#### **Level 1: Passive e-learning with no interactivities**

- This is similar to listening to a lecture where the speaker goes on speaking and learners just sit there and listen. In an online environment, this would be a course with largely text and static images. Navigation would be limited to simple Play/Pause and Next/Back buttons. It is a one-way communication with the objective of passing essential information for consumption of learners.
- However, it would not be an ideal format for training that impacts decision making on the job. According to some sources, 49% of e-learning courses are still developed at this level and it is unlikely that all of them are meant for the purpose of passing simple information.

#### **Level 2: Limited interactivities**

- Level 2 e-learning consists of limited interactivities. Something like the instructor posing a few questions to the audience now and then just to check for understanding and comprehension. In an online setting, this would be in the form of simple quiz questions that learners have to respond to before moving to the next segment. It could also be simple puzzles with drag and drop interactivity, animations, click on images, etc.
- If the intention is more than just knowledge transfer to learners (such as performance improvement or skill development), this is something one needs to consider in online courses.

#### **Level 3: More complex interactivities**

- At this level, the interactivities get more complex and require a detailed Instructional Design approach. This level is like having a hands-on workshop, team games, etc. that involve a great deal of learner engagement. Online courses with level 3 interactions would be typically rich in audio and video elements, customized visuals, interactions, games, or quizzes.
- This level of interactivity is a must for teaching a new software application where learners have an opportunity to work in a simulated environment. Compliance courses with story-based learning strategy, gamification, or real-life scenarios also could be created with this level of interactivity to a certain extent.

#### **Level 4: Highly simulated environment**

- In an online training, level 4 interactions may have high-end graphics, Virtual Reality, and 3D simulations which may be costly and also require the expertise of animators and coding specialists.

Table 1 Overview of e-learning courses setup across partner countries

| Partners country | Level of interactivity            | e-learning platform | Online teaching content | Type of material produced  |
|------------------|-----------------------------------|---------------------|-------------------------|--|
| Croatia          | Level 3                           | MoD Moodle          | Asynchronous            | Pdf presentations; Recorded video lessons; Videos; Dictionary; Database of test questions; Tests; Interactive games; Chat rooms; Forum |
| Estonia          | Level 2 + events                  | TalTech Moodle      | Asynchronous            | Pdf presentations; Videos; web links; Tests; Forum   |
| Italy            | Level 3 + in class                | ENEA e-Learn        | Asynchronous            | Lessons; Recorded video lessons; PPT presentations; Videos; BIM glossary; Links to external web sites and documents; Tests             |
| Lithuania        | Level 2                           | Moodle              | Asynchronous            | Pdf presentations; web links; Tasks; Forum   |
| Slovakia         | Level 1 + in-class demonstrations | Net-Ubiep Moodle    | Asynchronous            | Pdf presentations, Video demonstrations on using applications based on BIM in construction and maintenance, Tutorial with BIM glossary |
| Spain            | Level 3                           | Campus Fundacion    | Synchronous             | Video conferences, Video tutorials; Exercises; Practical test  |
| The Netherlands  | Level 2                           | Isso leerplatform   | Asynchronous            | Lessons, Videos, Tests   |

The current report describes the functionalities and main features of the relevant e-facilities developed in each partner country, while it identifies the courses that are available on the e-learning platform.

## 2. e-learning courses

### 2.1 Croatia

#### 2.1.1 E-course description

Providing online education can mean a number of different things from streaming content (e.g. screencasts or lectures on video) to offering complete online courses with online learning objects and synchronous and asynchronous online teaching and learning activities.

The Croatian E-learning course is designed to be freely **available for all interested parties (with a mandatory free registration)** and was designed with a total **estimated workload of 24 hours** for the learners. In order to make it totally open platform the recorded lectures are available at the Net-UBIEP web page where not even a free login is needed.



The **Croatian partners** opted to develop **asynchronous online teaching content** with the goal to provide learners the opportunity to follow the lessons independently of teachers (e-learning administrator's) activities at any time they wish, and as many times they need to do it to gain knowledge and skills. This was done to enable also people with lower digital competences to follow the course, and was implemented as a result of the discussions with trainees of the different target groups which happened during the classroom courses.

Additionally, the content of such education is designed to be scalable and support an unlimited number of students in contrast to synchronous online teaching where inevitably there is a need to limit the group size to be manageable for the teacher.

Learners can study and learn at their own pace, test their knowledge, and reinforce concepts through further reading or other online material such as models or simulations.

The main limitations associated with free online education as opposed to regular classroom educations include (medium related differences aside) the limited ability of working directly with a tutor or teacher.

The Croatian Net-UBIEP e-learning course is characterised by extensive use of E-learning tools such as recorded lectures, short quizzes (tests and games) where learners can perform self-evaluation as well as video demonstrations and chat rooms and forums where learners can communicate with their peers and teachers (instructors). The modules contain a number of E-lessons where learners listen to recorded presentations, can follow recorded step by step video demonstrations on BIM tools for different applications related to energy efficiency and NZEB in order to perform hands-on exercises with different BIM software, and discuss the related issues in online forum.

The “**Moodle MoD**” e-learning system provided by University Computing Centre (SRCE) of the University of Zagreb has been chosen as the learning platform for the course because it supports all of these activities. The E-learning system MoD (Moodle Community) (<http://mod.srce.hr/>) is established for e-learning projects in the community primarily to those started and initiated in the academic community.

**The main objectives of the e-courses are:**

- To disseminate Net-UBIEP project results.
- To educate workers, installers but also students, young professionals and practitioners.
- To support stakeholders, policy and decision-makers by offering them e-learning on BIM and energy efficiency.
- To provide online training facilities to the owners, tenants and building managers on BIM application in energy efficiency during the building's life cycle.
- To foster the uptake of BIM in energy efficiency related applications.
- To exploit future potential of creating a complete specialised programme/seminar on BIM and energy efficiency.

### 2.1.2 Functionalities and features of the e-learning platform

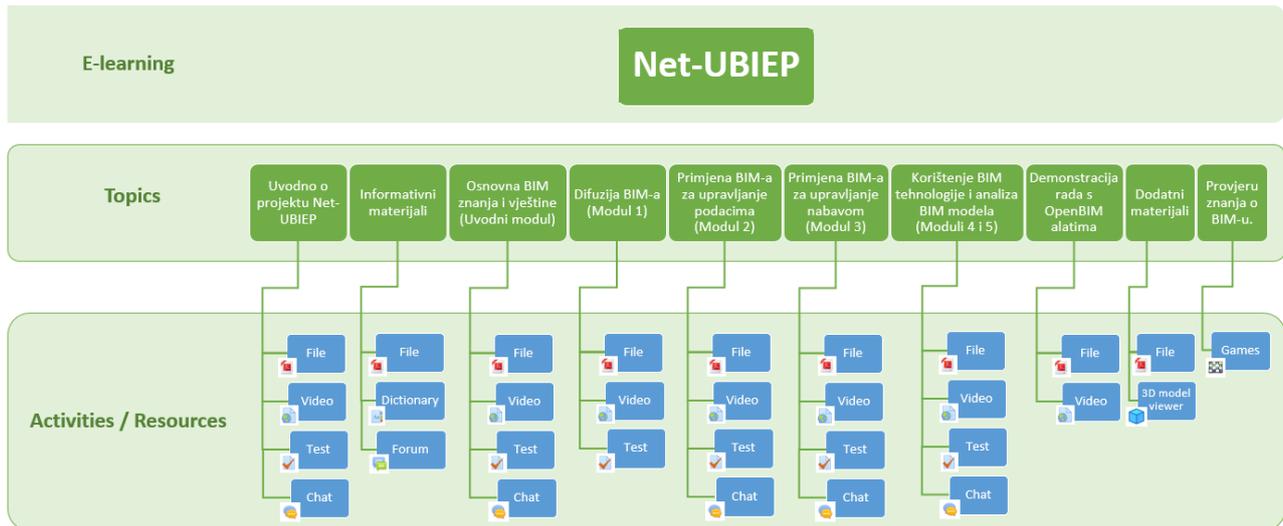
The Net-UBIEP website has been extended with a new functionality, the e-learning platform <http://www.net-ubiep.eu/hr/platforma-za-e-ucenje-projekta-net-ubiep/>.

The e-learning platform is a public area of the website, accessed by all interested users (mandatory registration for free access), and provides online training and educational material, structured under specific



topics. The instructors of the course have editing privileges and can create lessons and topics, upload training material etc.

The fundamental structure of the platform is the following:



Key features of the developed Net-UBIEP e-learning course:

- The instructor can easily create an unlimited number of Lessons, and Topics, and upload educational material.
- The publishing of each lesson can be scheduled for a specific date/time.
- The instructor can upload videos and e-learning files to supplement the course material.
- The instructor can create quizzes to be taken after the completion of the lessons. There are several types of quizzes to choose from.
- Learners have the option to download all training material whenever they wish.
- Learners have a possibility to provide feedback or ask questions at the end of each topic in a form of a chat with instructors.
- Private or public forums connected to the information materials developed within the Net-UBIEP project are available.
- Instructors can run reports on the users' activity.

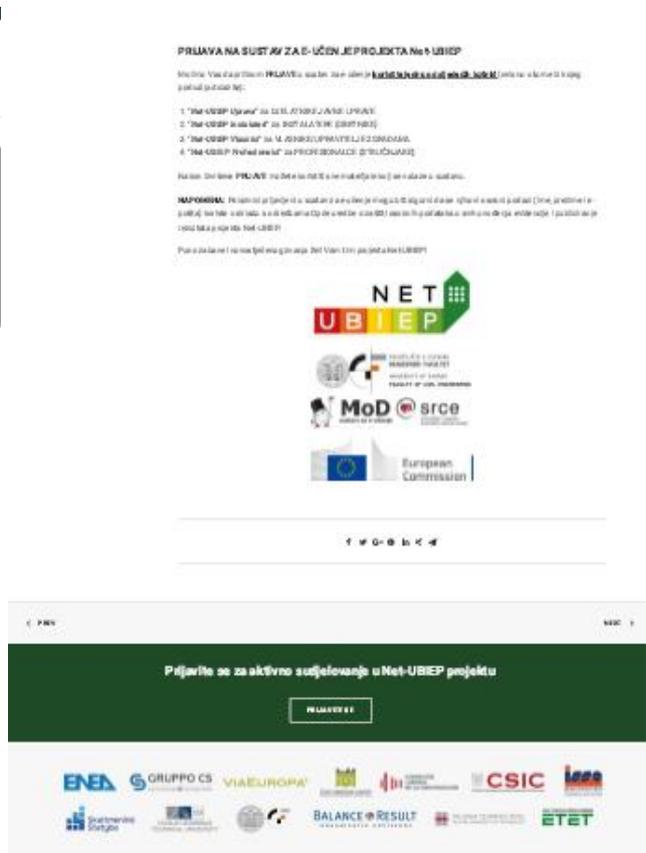
Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- Learning material is presented in a different way online, which gives course participants time to reflect and discuss course topics in depth
- difficulties with the hands-on exercises in BIM software. It is difficult for the teachers and fellow course participants to provide the necessary guidance when they could not see the participants' screen.
- it was hard for learners to contribute with new information to the group discussions once a few participants had answered a given question from the teachers. Some questions were thus revised or replaced with a quick multiple-choice questionnaire or short games for self-testing, which also made the course material more varied.



- The completion rate is not necessarily representative for future Net-UBIEP e-learning courses because the participants attended the Net-UBIEP e-learning course for free and they use it to learn basics of BIM and energy efficiency in buildings. The payment of a fee (by industry clients) is expected to be an important motivation factor when it comes to completing the course. The other motivation for completing the full course would be the certification system which would recognise the developed e-learning course as relevant for gaining BIM and NZEB competences.
- The learning material should have at least the same quality as material taught in regular classes, thus empowering learners who would otherwise not be able to seek classroom courses on BIM

The main page of the Croatian Net-UBIEP E-learning platform <http://www.net-ubiep.eu/hr/platforma-za-e-ucenje-projekta-net-ubiep/>



The main page of a course (content and features) is shown in the figures below:



The screenshot shows the MoD web application interface. The top navigation bar includes 'Rad na sustavu', 'Helpdesk', 'Moji e-kolegiji', and 'Sadržaj'. The user is identified as 'Bojan Milovanović'. The main content area is titled 'Network for Using BIM to Increase the Energy Performance' and includes a search bar and navigation tabs for 'Moja naslovnica', 'Moji e-kolegiji', 'Tehničko područje', and 'Network for Using BIM to ...'. A sidebar on the left contains navigation options like 'Sudionici', 'Značke', 'Ocjene', 'Moja naslovnica', 'Kalendar', 'Osobne datoteke', and 'E-kolegiji'. The main content area features a 'KALENDAR' for July 2019, a 'NOVE OBAVIJESTI' section with a 'Dodaj novu temu...' button, and an 'ADMINISTRACIJA' section with various management options. Below these are 'Opći dio' (General part) with a welcome message and a list of items, 'Uvodno o projektu Net-UBIEP' (Introduction to the project) with the project logo and a list of items, and 'Informativni materijali' (Informational materials) with an image of books.



**PRISTUPACNOST**

A- A+ A

**KORISNICI ONLINE**

1 korisnik online (u posljednjih 5 minuta)

Bojan Mitovanovic

- Trening materijali za profesionalce
- Trening materijali za djelatnike javne uprave
- Trening materijali za vlasnike i upravitelje zgradama
- Trening materijali za instalatere (obrtnike)
- BIM rječnik
- Forum o razvijenim trening materijalima

### Osnovna BIM znanja i vještine (Uvodni modul)

- Prezentacija u .pdf formatu
- Snimka predavanja prema .pdf prezentaciji
- Osnovna BIM znanja i vještine
- Razgovor uvodnom modulu

### Difuzija BIM-a (Modul 1)

Diagram showing stakeholders: Developers, Facility Managers, Users, Architects/Designers, Government Agencies, Building Owners, Contractors, Quantity Surveyors, Manufacturers, Information Providers, Engineers, and Building Conditions, all connected to a central BIM Model.

1

2

- Prezentacija u .pdf formatu
- Snimka predavanja prema .pdf prezentaciji
- Difuzija BIM-a
- Razgovor o Modulu 1

### Primjena BIM-a za upravljanje podacima (Modul 2)

- Prezentacija u .pdf formatu
- Snimka predavanja prema .pdf prezentaciji
- Primjena BIM-a za upravljanje podacima
- Razgovor o Modulu 2

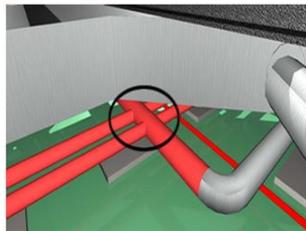
### Primjena BIM-a za upravljanje nabavom (Modul 3)

- Prezentacija u .pdf formatu
- Snimka predavanja prema .pdf prezentaciji
- Primjena BIM-a za upravljanje nabavom
- Razgovor o Modulu 3

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3

### Korištenje BIM tehnologije i analiza BIM modela (Moduli 4 i 5)



4

- Prezentacija u .pdf formatu
- Snimka predavanja prema .pdf prezentaciji

### Dodatni materijali

- Praktični rad u BIM programskom paketu Allplan (radionica 9. ožujka 2019.)
- Praktični rad u BIM programskom paketu Allplan - AX3000 (radionica 9. ožujka 2019.)
- Jednostavni prikaz modela bez informacija izvezen iz BIM okruženja

### Provjerite koliko ste naučili o BIM-u

- Kvizaljka
- Sudoku
- Vještalo

### Demonstracija rada s OpenBIM alatima



Moodle Docs za ovu stranicu

**Helpdesk**

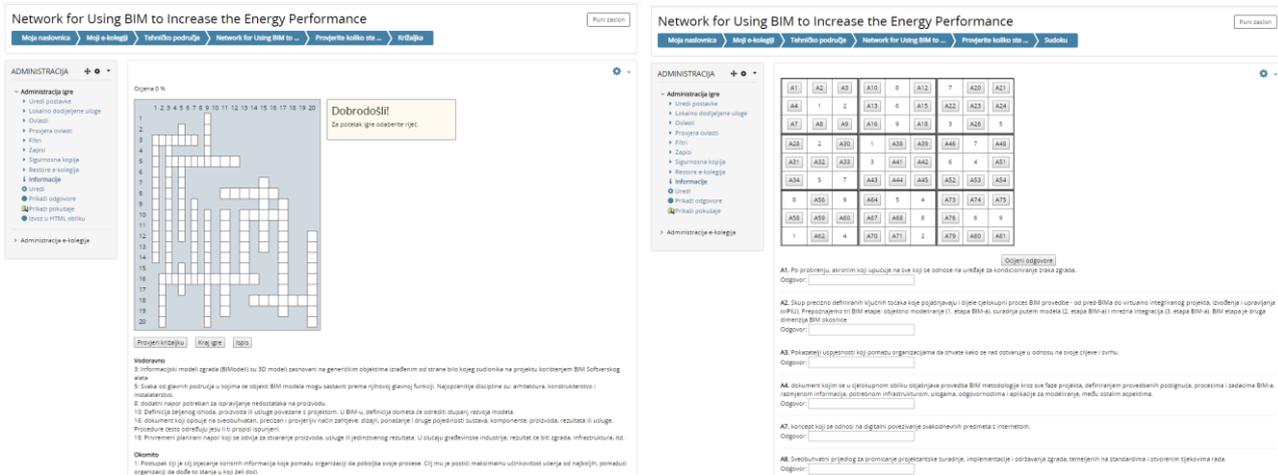
Za sva pitanja javite se Centru za e-učenje:  
Online lupit  
E-mail: moodle@srce.hr  
01/616 3171 (radnim danom od 9 do 16)  
Najčešće postavljena pitanja

**Centar za e-učenje**

Web stranica Centra za e-učenje



Screen capture of the short quizzes (games) in Croatia language is shown below:



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## 2.2 Estonia

### 2.2.1 E-course description

The e-learning platform is a public area of the website, accessed by all interested users (content can be accessed by everyone, but to solve tests and quizzes, one needs to register), and provides online training and educational material, structured under specific topics. The instructors of the course have editing privileges and can create lessons and topics, upload training material etc.

**Estonian partners** have developed Net-UBIEP e-learning course using the TalTech Moodle (<https://moodle.taltech.ee/course/view.php?id=22410&lang=en>), where self-learning materials, videos and tests are available for learners to use them.

In total 5 modules of Net-UBIEP course were developed in Estonia as follows:

- Introduction
- Module: Public Administration
- Module: Specialists
- Module: Technicians
- Module: Owners

If one wants to enrol in a Module for a specific target group, he/she must firstly finish the Introduction module to learn about Net-UBIEP project as well as the basis of BIM and energy efficiency in buildings. Currently, the module for technicians is filled with content, while other modules are under development.

The main page of the Estonian Net-UBIEP E-learning platform is available on the following link <https://moodle.taltech.ee/course/view.php?id=22410&lang=en>



## Net-UBIEP Network for Using BIM to Increase the Energy Buildings Performance

Home > Courses > Tallinna Tehnikaülikool > Schools > School of Engineering > Department of Civil Engineering and Architecture > Net-UBIEP

**ACTIVITIES**

- Forums
- Quizzes
- Resources

**NAVIGATION**

- Home
- Site pages
- Courses
  - Tallinna Tehnikaülikool
    - Institutions
    - Administrative and Support Structure
    - Schools
      - School of Engineering
        - Department of Civil Engineering and Architecture
          - EAI0030
          - EAI0021
          - EKV5060
          - EEK5120
          - ETT0220
          - EKK5030
          - ETG5220
          - ETG5104
          - EPX5540

**Õppemoodulid**

Sissejuhatus

Moodul: Avalik haldus

Moodul: Spetsialistid

Moodul: Tehnikud

Moodul: Omanikud

The Estonian E-learning course is designed to be freely available for all interested parties (with a mandatory registration to be able to access tests) and was designed with a total estimated workload of 24 hours for the learners.

The Estonian partners opted to develop asynchronous online teaching content with the goal to provide learners the opportunity to follow the lessons independently of teachers (e-learning administrator's) activities at any time they wish, and as many times they need to do it to gain knowledge and skills. The Estonian Net-UBIEP e-learning course is characterised by extensive use of pdf presentations on BIM, energy efficiency and NZEB.

The Estonian partners developed a Multiple Choice Test - A test of the ability to find information from a model. The test requires the download of sample files (IFC) and the use of an optional IFC viewer software (from the recommended list). All questions have one correct answer. After completing the test, it is possible to see the overall result, including which questions were answered correctly. The correct answer is not displayed. Learners can take the test any number of times. The test is time limited (3 h). After the time has elapsed, the test performance is submitted to an automatic check, where unanswered questions are not analysed. Learners need at least 81% correct answers to complete the test.

Some examples of exercises developed for the purposes of e-learning courses and practice work are shown below. These can also be used for exam purposes.

The fundamental structure of the platform of the Module for technicians is the following:



## Moodul: Tehnikud

Sissejuhatus moodulisse

Sissejuhatus energiatõhususse ja BIMi

- Sissejuhatus energiatõhususse
- Projekteeritud ja mõõdetud energiakasutus
- Sissejuhatus BIMi
- BIM mudelite rakendamine

Energiatõhususe ja BIMi protsessid

- BIM nõuded ja praktika erinevates etappides
- BIMi kutse ja selle kasutus ehitushankes
- Energiatõhususe projekteerimine varajases staadiumis
- BIM mudeli ja energiamärgise info alusel energiatõhususe suurusjärgu kontrollimine
- Info ülekandmine BIMist energiatõhususe tarkvarasse

Piirdetarindite soojuskood

- Õhuga kontaktis olev piirdetarind
- Pinnasega kontaktis olev piirdetarind
- Piirdetarindite liitekohad ja õhulekked
- Aken ja geometria

Tehnosüsteemid ja taastuenergia

- Soojuspumba ringprotsess
- Soojusvarustus ja soojusõlme skeem
- Ühe- ja kahetoru küttesüsteemi erinevus

Energia- ja kuluoptimaalsete ehitiste projekteerimise protsess

BIMi rakendamine organisatsioonis ja projektis

- BIM strateegia projektis ja organisatsioonis
- BIM strateegia

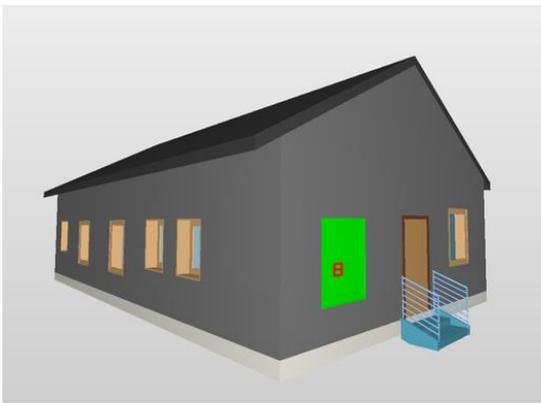
IFC vaaturtarkvarad

- Trimble Connect (veebipõhine + installeeritav)
- Autodesk Viewer (veebipõhine)

Järelemõtlemiseks (vajalik sooritada koondarvestuse saamiseks)

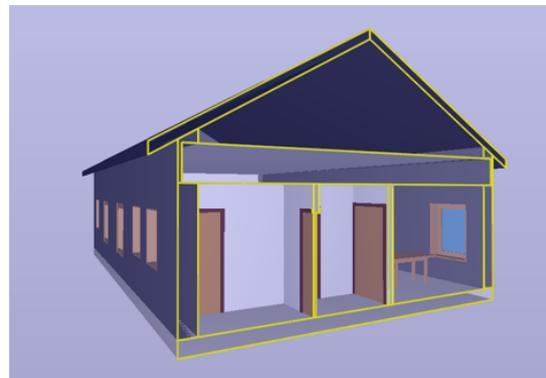
- Valikvastustega test - mudelist info leidmise oskuse kontroll
- Näidisfail - 01 Lihtne hoone (eramaja)
- Näidisfail - 02 Küte ja ventilatsioon

### 1 Window



| Küsimus                                  | Lahendus |
|--|----------|
| 1.1 Find the window symbol in the model. |          |

### 2 Section



|  |  |
|--|--|
| 2.1 Make the section                           | Set the plane<br>Move the plane                |
| 2.2 Find the height of the room from the model | Make the section<br>Measure height: 2600mm<br> |



5 Wall



3 Plan

| <p>3.1 Make the floor plan</p>  |   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
|---|---|----------|-------|------|-----------------------|------------|-----------------------|------------------|---------------------|-----------|---------|-----------------------|------|-----------|--------|--------|----------------------|---------------------|--------|---------------------|---------|--------------------|--------|
| <p>3.2 Area?</p> <p>3.3 Length of wall and floor joint (thermal bridge)</p> | <table border="1"> <thead> <tr> <th>Property</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Area</td> <td>112.30 m<sup>2</sup></td> </tr> <tr> <td>Gross Area</td> <td>112.30 m<sup>2</sup></td> </tr> <tr> <td>Area of Openings</td> <td>0.00 m<sup>2</sup></td> </tr> <tr> <td>Perimeter</td> <td>44.08 m</td> </tr> <tr> <td>Perimeter of Openings</td> <td>0 mm</td> </tr> <tr> <td>Thickness</td> <td>303 mm</td> </tr> <tr> <td>Volume</td> <td>34.23 m<sup>3</sup></td> </tr> <tr> <td>Bounding Box Height</td> <td>303 mm</td> </tr> <tr> <td>Bounding Box Length</td> <td>14.02 m</td> </tr> <tr> <td>Bounding Box Width</td> <td>8.21 m</td> </tr> </tbody> </table> | Property | Value | Area | 112.30 m <sup>2</sup> | Gross Area | 112.30 m <sup>2</sup> | Area of Openings | 0.00 m <sup>2</sup> | Perimeter | 44.08 m | Perimeter of Openings | 0 mm | Thickness | 303 mm | Volume | 34.23 m <sup>3</sup> | Bounding Box Height | 303 mm | Bounding Box Length | 14.02 m | Bounding Box Width | 8.21 m |
| Property  | Value   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Area  | 112.30 m <sup>2</sup>   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Gross Area  | 112.30 m <sup>2</sup>   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Area of Openings  | 0.00 m <sup>2</sup>   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Perimeter   | 44.08 m   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Perimeter of Openings   | 0 mm  |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Thickness   | 303 mm  |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Volume  | 34.23 m <sup>3</sup>  |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Bounding Box Height   | 303 mm  |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Bounding Box Length   | 14.02 m   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| Bounding Box Width  | 8.21 m  |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |
| <p>3.4 Find the width and length of the room in the model</p>               |   |          |       |      |                       |            |                       |                  |                     |           |         |                       |      |           |        |        |                      |                     |        |                     |         |                    |        |

| <p>5.1 Find the thickness of the external wall insulation in the model</p>              | <table border="1"> <thead> <tr> <th>Name</th> <th>Thickness</th> </tr> </thead> <tbody> <tr> <td>PVC Flexible</td> <td>3 mm</td> </tr> <tr> <td>Concrete, C25/30</td> <td>100 mm</td> </tr> <tr> <td>EPS TERM EPS 100</td> <td>200 mm</td> </tr> </tbody> </table>  | Name | Thickness | PVC Flexible  | 3 mm | Concrete, C25/30 | 100 mm | EPS TERM EPS 100 | 200 mm |
|---|---|------|-----------|---------------|------|------------------|--------|------------------|--------|
| Name  | Thickness   |      |           |               |      |                  |        |                  |        |
| PVC Flexible  | 3 mm  |      |           |               |      |                  |        |                  |        |
| Concrete, C25/30  | 100 mm  |      |           |               |      |                  |        |                  |        |
| EPS TERM EPS 100  | 200 mm  |      |           |               |      |                  |        |                  |        |
| <p>5.2 Find the thermal conductivity of the external wall insulation from the model</p> | <table border="1"> <thead> <tr> <th>Name</th> <th>Thickness</th> </tr> </thead> <tbody> <tr> <td>PVC, Flexible</td> <td>3 mm</td> </tr> <tr> <td>Concrete, C25/30</td> <td>100 mm</td> </tr> <tr> <td>EPS TERM EPS 100</td> <td>200 mm</td> </tr> </tbody> </table> | Name | Thickness | PVC, Flexible | 3 mm | Concrete, C25/30 | 100 mm | EPS TERM EPS 100 | 200 mm |
| Name  | Thickness   |      |           |               |      |                  |        |                  |        |
| PVC, Flexible   | 3 mm  |      |           |               |      |                  |        |                  |        |
| Concrete, C25/30  | 100 mm  |      |           |               |      |                  |        |                  |        |
| EPS TERM EPS 100  | 200 mm  |      |           |               |      |                  |        |                  |        |
| <p>5.3 Find the total thickness of the outer wall from the model</p>                    |   |      |           |               |      |                  |        |                  |        |

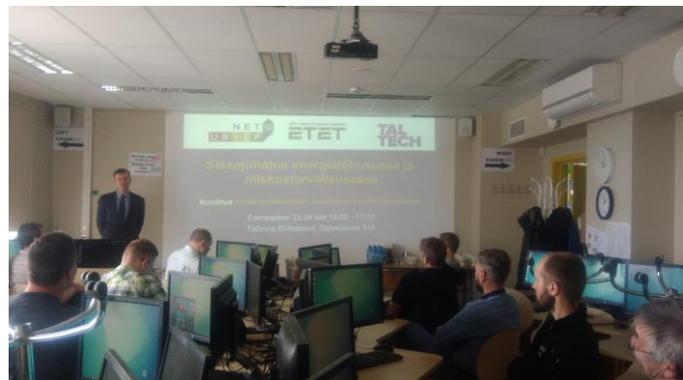
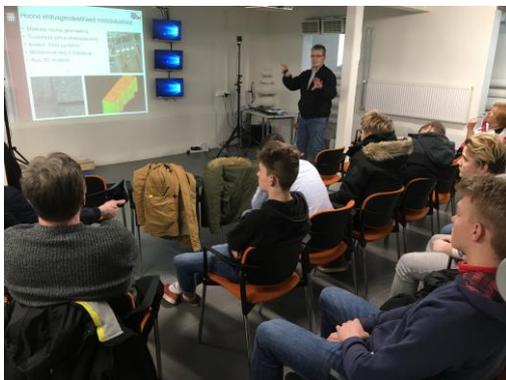




- Heat loss and moisture damage to the building envelope
- Energy efficiency planning in building construction
- Humidity prevention solutions in construction
- Introduction to BIM
  - Terms, principles, process description
  - BIM vs. CAD
  - BIM standards and guidelines BIM project and construction objectives and uses,
  - Examples of best / worst theory and best / worst practice
- Computer class
  - Model opening, navigation
  - Surfing the model and looking for material properties
  - Exercise tasks according to the skill of the construction worker
- Computer class
  - Measuring dimensions and volumes
  - View material properties
  - Exercise tasks according to the skill of the construction worker

In total, **27 participants** attended the VET teachers and skilled workers' events in Estonia within the framework of the Net-UBIEP project.

Several images from the events for VET teachers and skilled workers conducted by the TUT can be found below. Left - event on February 5<sup>th</sup> 2019; right - event on April 22<sup>nd</sup> 2019.



### 2.2.3 Agenda

Agenda for the event for VET teachers and skilled workers organized on **February 5<sup>th</sup> 2019** (left) and event organized on **April 22<sup>nd</sup> 2019** (right).



Hoonete energiatõhususe tagamine BIM'i abil koolitus  
kutseõppeasutuste õpetajatele ja oskustöölisele  
(BIM vaataja kompetent)

Ajakava

| Sissejuhatus teemasse                        |                |  |
|--|----------------|--|
| Kuupäev ja aeg: 5.02.2019 kell 10:00 - 14:00 |                |  |
| Asukoht: Tallinna Tehnikaülikool             |                |  |
| Aeg  | Koolitaja      | Teema  |
| 10:00-11:15                                  | Alo Mikola     | Ventilatsioon & BIM Mektory  |
| 11:15-11:50                                  | Alo Mikola     | BIMi alusel paigaldatud kaasaegsed tehnosüsteemid renoveeritud hoones.                                     |
| 11:50-12:30                                  | Peep Pihelo    | Renoveerimine & BIM St. üks võimalus, kuidas muuta vana ühiselamu kaasaegseks ja energiatõhusaks           |
| 12:30-13:30                                  | Targo Kalamees | Mida teada, mida õppida ja kuidas ehitada paremini? Kuidas BIMi kasutamine aitab parandada energiatõhusust |
| 13:30 - 14:00                                |                | Arutelu  |



Hoonete energiatõhususe tagamine BIM'i abil koolitus  
kutseõppeasutuste õpetajatele ja ehitustöölisele

Ajakava

| Sissejuhatus teemasse                              |                                     |   |
|--|-------------------------------------|---|
| Kuupäev ja aeg: Esmaspäev 22.04 kell 10:00 - 17:00 |                                     |   |
| Asukoht: Tallinna Ehituskool                       |                                     |   |
| Aeg  | Koolitaja                           | Teema   |
| 10:00-11:30  | Targo Kalamees                      | Sissejuhatus energiatõhususse ja niiskusturvalisusse <ul style="list-style-type: none"> <li>Energiatõhususe indikaatorid</li> <li>Piirdetarindite soojuskaod ja niiskuskahjustused</li> <li>Energiatõhususe kavandamine hoonel ehitamisel</li> <li>Niiskushajustuste vältimise lahendused ehitamisel</li> </ul> |
| 11:30-11:45  |                                     | <b>Paus 15 minutit</b>  |
| 11:15-13:15  | Raido Puust Ergo Pikas              | Sissejuhatus BIM-i <ul style="list-style-type: none"> <li>Terminid, printsüübid, protsessi kirjeldus</li> <li>BIM versus CAD</li> <li>BIM standardid ja juhendid BIM projekti ja ehituse eesmärgid ja kasutusala</li> <li>Näited parimast/halvimast teooriast ja parimast/halvimast praktikast</li> </ul>       |
| 13:15-14:15  |                                     | <b>Lõuna 1 tund</b>   |
|  | Raido Puust Ergo Pikas Anti Hamburg | Arvutiklassis <ul style="list-style-type: none"> <li>Mudeli avamine, navigeerimine</li> <li>Mudelis surfamine ja materjaliomaduste otsimine</li> <li>Harjutustulesanded vastavalt ehitustöölise kutseoskustele (vt. lk 2-4)</li> </ul>  |
| 15:45 - 16:00                                      |                                     | <b>Paus 15 minutit</b>  |
|  | Raido Puust Ergo Pikas Anti Hamburg | Arvutiklassis <ul style="list-style-type: none"> <li>Mõõtude ja mahtude mõõtmine</li> <li>Materjaliomaduste vaatamine</li> <li>Harjutustulesanded vastavalt ehitustöölise kutseoskustele (vt. lk 2-4)</li> </ul>  |
| 16:00 - 17:00                                      |                                     | Arutelu   |

## 2.3 Italy

### 2.3.1 E-course description

The Italian E-learning course is designed to be freely **available for all interested parties (with a mandatory free registration)** and was designed with a total **estimated workload of 24 hours** for the learners.

The **Italian partners** opted to develop **asynchronous online teaching content** with the goal to provide learners the opportunity to follow the lessons independently of teachers (e-learning administrator's) activities at any time they wish, and as many times they need to do it to gain knowledge and skills. Learners can study and learn at their own pace, test their knowledge, and reinforce concepts through further reading or other online material such as models or simulations.

The Net-UBIEP website has been extended with a new functionality, the e-learning platform <http://www.net-ubiep.eu/it/e-learning-5/>.

The e-learning platform is a public area of the website, accessed by all interested users (mandatory registration for free access), and provides online training and educational material, structured under specific topics. The instructors of the course have editing privileges and can create lessons and topics, upload training material etc. The main page of the Italian Net-UBIEP E-learning platform





The first e-learning course on the use of BIM to improve the energy performance of buildings was published on the [www.formazione.enea.it](http://www.formazione.enea.it) platform.

Although the course is designed specifically for technicians, it can be useful for anyone who wants to learn about this use of Building Information Modelling. To view the course, learners must perform a free registration. The title of the course is BIM, training for technicians.

The first video lesson of the course on BIM and its diffusion is available on-line to get an improvement in the energy performance of buildings. During the first lesson the issues related to the strategies to be adopted to implement BIM within a public or private company are being addressed.

### 2.3.2 Functionalities and features of the e-learning platform

To access the ENEA E-learn platform click here: <http://www.net-ubiep.eu/it/iframe-test/>

The Italian Net-UBIEP e-learning course is characterised by extensive use of E-learning tools such as recorded lectures, lessons, links to external web sites and documents useful for learners. Additionally, short quizzes (tests) are available, where learners can perform self-evaluation. The modules contain a number of E-lessons where learners can read materials developed on BIM for different applications related to energy efficiency and NZEB.

Educational objectives of the developed e-learning course in Italy are:

- The usefulness of BIM for energy efficiency in buildings
- The different uses of the BIM model for energy efficiency in buildings

On the e-learning web page <http://www.net-ubiep.eu/it/e-learning-5/>, a video was also uploaded showing how it is possible to design a photovoltaic system, starting from the geographical data and the survey of an existing building. The photovoltaic project, made with BIM software, is "federated" to the architectural project obtained by importing an ifc file. The software allows, once the system has been identified, to simulate shading and therefore optimize the design choices. Finally, the report to be printed for the presentation of the project to the competent authorities can be created with simple mouse movements.

The main page of a course (content and features) is shown in the figures below:



The screenshot displays the website interface for NET-UBIEP. At the top, there is a navigation bar with links for Home, Progetto NET-Ubiep, Deliverable, News&Events, Certificazione, Knowledge MS, Portatori d'interesse, and Contatti. The main content area is titled 'Corsi' and is divided into two columns. The left column, 'Lista dei corsi', lists five courses with their respective icons and 'Scheda' buttons. The right column, 'Scheda del corso', provides detailed information for the selected course, 'BIM formazione per tecnici', including its description, instructor (Anna Moreno, christian girardello), format (e-learning), and a green 'ACCEDI' button.

| Lista dei corsi   |                        |
|---|------------------------|
| BIM Formazione Per Tecnici  | <a href="#">Scheda</a> |
| BIM Training For Technicians  | <a href="#">Scheda</a> |
| Project Network For Using BIM To Increase The Energy Buildings Performance  | <a href="#">Scheda</a> |
| Project Network For Using BIM To Increase The Energy Buildings Performance - La Progettazione Preliminare           | <a href="#">Scheda</a> |
| Project Network For Using BIM To Increase The Energy Buildings Performance - La Progettazione Preliminare (Parte 2) | <a href="#">Scheda</a> |

| Scheda del corso  |
|---|
| <b>BIM formazione per tecnici</b>   |
| The course contains the basic knowledge for the Building Information Modelling (BIM) useful for the modern technicians who need to know how to work in a digitalized world.                                 |
| <b>Docenti:</b><br>Anna Moreno, christian girardello  |
| <b>Obiettivo formativo:</b><br>The usefulness of BIM The different uses of the BIM model  |
| <b>Contenuti:</b><br>The course is structured in xx modules and yy lessons  |
| <b>Conoscenze richieste:</b><br>The course contains the basic knowledge for the Building Information Modelling (BIM) useful for the modern technicians who need to know how to work in a digitalized world. |
| <a href="#">ACCEDI</a>  |

Here, learners can choose to take the lessons developed in Italian or English languages as well as recorded video lessons in Italian language. The e-learning lessons developed have exactly the same content in Italian and English language.

Screen captures of the lessons example in Italian and English language is shown below:





Uno dei principi di base del **Building Information Modelling** è lo scambio di dati, facile e sicuro tra le diverse figure coinvolte a livelli diversi nel progetto (**principio di interoperabilità**).

Una **"strategia BIM aperta"** supporta un flusso di lavoro trasparente e aperto, consentendo ai membri del progetto di partecipare indipendentemente dagli strumenti software utilizzati e creando un linguaggio comune per processi ampiamente referenziati, consentendo all'industria e al governo di procurare progetti con un impegno commerciale trasparente, valutazione comparativa del servizio e qualità dei dati garantita.

Open BIM fornisce dati di progetto durevoli per l'utilizzo lungo tutto il ciclo di vita del bene, evitando input multipli degli stessi dati e errori conseguenziali. I fornitori di software di piccole e grandi dimensioni (piattaforme) possono partecipare e competere su soluzioni "best of breed" indipendenti dal sistema. Open BIM energizza il lato dell'offerta di prodotti online con ricerche più esatte su richiesta degli utenti e consegna i dati del prodotto direttamente nel BIM.

**Indice del corso:**

- ▣ Introduzione
- Test [if](#)
- ▣ BIM Conoscenze e abilità
- Introduzione: cosa è il BIM?
- Glossario BIM
- Vantaggi degli usi differenti del BIM
- Usi del modello
- Strumenti Open BIM
- Standardizzazione
- L'ambiente di condivisione dati (CDE - Common Data Environment)
- Test [if](#)
- ▣ Diffusione del BIM
- ▣ Gestione delle informazioni
- Test [if](#)
- ▣ Gestione degli appalti
- Test [if](#)
- ▣ Utilizzo di tecnologie BIM
- Test [if](#)
- ▣ Analisi del modello BIM
- Test [if](#)



One of the basic assumptions of Building Information Modelling is the **easy and secure exchange of data** between the different figures involved at distinct levels in the project (**principle of interoperability**).

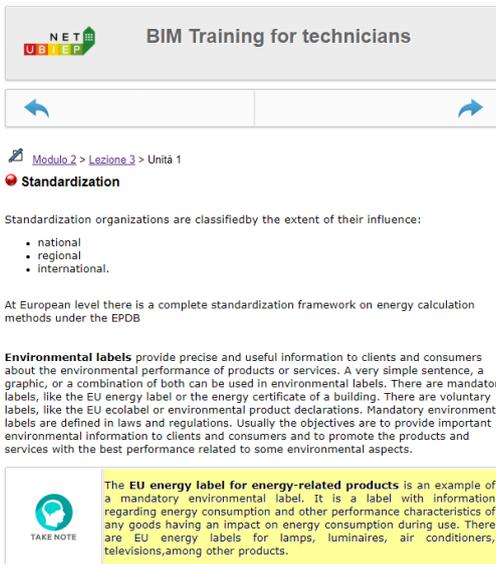
An **"open BIM strategy"** supports a transparent, open workflow, allowing project members to participate regardless of the software tools they use and creating a common language for widely referenced processes, allowing industry and government to procure projects with transparent commercial engagement, comparable service evaluation and assured data quality.

Open BIM provides enduring project data for use throughout the asset life-cycle, avoiding multiple input of the same data and consequential errors. Small and large (platform) software vendors can participate and compete on system independent, 'best of breed' solutions. Open BIM energizes the online product supply side with more exact user demand searches and delivers the product data directly into the BIM.

**Indice del corso:**

- ▣ Introduction
- Test [if](#)
- ▣ Basic BIM knowledge and skills
- Introduction: what is BIM?
- BIM glossary
- Advantages and value of using BIM for different uses
- Model Uses
- Open BIM tools
- Standard Format
- The CDE (Common Data Environment)
- Test [if](#)
- ▣ Diffuse BIM
- ▣ Apply information management
- Test [if](#)
- ▣ Apply procurement management
- Test [if](#)
- ▣ Use BIM technology
- Test [if](#)
- ▣ Analyse the BIM Model
- Test [if](#)

Screen capture showing a part of the developed e-learning content (in English) related to energy efficiency is shown in the following images:



**Indice del corso:**

- ▣ Introduction
- Test [if](#)
- ▣ Basic BIM knowledge and skills
- Introduction: what is BIM?
- BIM glossary
- Differing BIM uses and their advantages
- Model Uses
- Open BIM tools
- Standardization
- The CDE (Common Data Environment)
- Test [if](#)
- ▣ Diffuse BIM
- ▣ Apply information management
- Test [if](#)
- ▣ Apply procurement management
- Test [if](#)
- ▣ Use BIM technology
- Test [if](#)
- ▣ Analyse the BIM Model
- Test [if](#)

- **environmental labelling programmes:** award a product or service with a mark or a logo based on the fulfilment of a set of criteria defined by the programme operator. In order to become credible among consumers, these programmes should follow the requirements established in the international standard ISO 14024.
- **environmental product declarations:** provide clients with a set of life cycle data describing the environmental aspects of a product or service. In order to become credible among consumers, these declarations should follow the requirements established in the international standard ISO 14025.

According to ISO standards, claims that are vague and non-specific shall not be used, because they are misleading.

**TAKE NOTE**

The **EU ecolabel** is an example of a voluntary environmental label. The EU ecolabel identifies products and services that have a reduced environmental impact throughout their life cycle, from the extraction of raw material through to production, use and disposal. The EU ecolabel awards products and services that fulfill a set of environmental criteria defined for the respective product category.



Energy classes (source [www.enea.it](http://www.enea.it)) / Ecolabel (source [www.ecolabel.eu](http://www.ecolabel.eu))

The energy certification of **buildings** is mandatory in all EU countries. The building energy class can be used as a label in advertising providing information on the energy performance of the building for buyers or tenants.

There are mainly **three types of voluntary environmental labels**:

- **self-declared environmental claims:** are made by producers that wish to inform consumers that their product is better than others in what concerns a particular environmental aspect. In order to become credible among consumers, these claims should follow the requirements established in the international standard ISO 14021.





- Indice del corso:**
- ▣ Introduction [Test it!](#)
  - ▣ Basic BIM knowledge and skills [Test it!](#)
  - ▣ Diffuse BIM [Test it!](#)
  - ▣ Apply information management [Test it!](#)  
*Principle of data management in the CDE (Common Data Environment)*  
*The identification of non-graphic information for the BIM Model*  
*The maintenance plan in EPC (Energy Performance Contracting)*
  - ▣ Apply procurement management [Test it!](#)
  - ▣ Use BIM technology [Test it!](#)
  - ▣ Analyse the BIM Model [Test it!](#)

**Modulo 4 > Lezione 3**  
**The maintenance plan in EPC (Energy Performance Contracting)**

The **EPC (Energy performance contracting)** is a contractual arrangement between a building owner or occupier (including public authorities) and an Energy Service Company (ESCO) to improve the energy efficiency of a building.

The investment costs are typically covered by the ESCo or a third party such as a bank, so no financial outlay is required by the public authority. The ESCo receives a fee, usually linked to the guaranteed energy savings. After the specified contracting period, the savings from energy efficiency improvements to the building will revert to the public authority. Energy performance contracting is often undertaken in respect of groups of buildings, in order to make the contracts more attractive to potential investors.

In the EPC the **maintenance** for the duration of the contract is up to the ESCo proposing the refurbishment. It has been demonstrated that even a NZEB design can bring to higher costs than foreseen in the design phase, for two main reasons: the first is that during the construction some changes occur that worsen the energy performance, the second reason is that inhabitants do not know how to use the technology and have higher management costs.

In both cases the **use of BIM** will mitigate if not solve those problems. If BIM is correctly implemented, together with the physical building a twin virtual building will be realized and will be enriched with all the **information needed for the maintenance**. Besides, a remote control of the building functionalities such as a building automation system, will allow the building manager to intervene any time some misuse is identified.

Once the contract ends, the building maintenance is under the responsibility of its owner which must use, whenever appropriate, a qualified technician to perform the inspections. A good maintenance depends on the analysis of the anomalies detected during the inspections of the site.

BIM models have revealed themselves as an excellent tool when it comes to supporting maintenance actions, due to their ability to store enough information in one place and by allowing the user to obtain realistic perspectives and exact drawings.



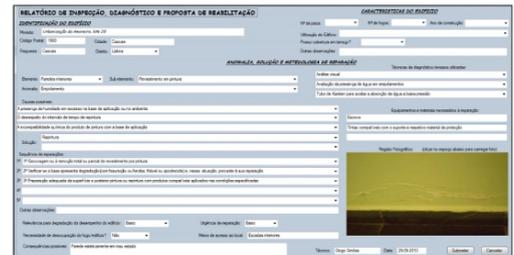
During an inspection operation for maintenance purposes, the developed application, containing a rigorous database, allows the user to identify each anomaly present in building components, directly onto the BIM model, automatically associating them with probable causes, repair methods and a photograph of the anomaly uploaded at the site. Therefore, gains in productivity and a decrease in the error probability can be achieved. The inspection data, converted to the PDF format, is stored in the BIM model, making it suitable for consultation when planning maintenance. Additionally, the interoperability between BIM modeling and visualizing software, regarding the preservation of information, is ensured when IFC format is used.

Therefore, during an inspection, the **maintenance technician**, when observing an anomaly, can consult the database support to fill out the inspection sheets and select the identified anomaly on the site. Subsequently, the completed inspection sheet is then converted to the PDF format and inserted into the BIM model. This model should be constantly updated, in order to accurately support the facility with repair and maintenance plans. There are different software application developed for this purpose, an example of computer application interface is illustrated in the figure below.



Application for EPC (source: [www.guarantee-project.eu](http://www.guarantee-project.eu))

A **sheet of the inspection** must include some initial information such as identification of the technician, the date of the inspection and the identity and characteristics of the building (address, city, number of floors, year of construction, etc...). Most of this information is selected from ComboBox elements, so the registration is carried in a fast way. A ComboBox element is defined with a combination of a text box and a list box, allowing the filling of the text box with one of the options provided in the list that appears as a descending menu.



Application for EPC (source: [www.guarantee-project.eu](http://www.guarantee-project.eu))

The application also allows including a photograph of the anomaly taken at the site and convert the information presented in the sheet of inspection to a document in PDF format. Such possibilities are essential for an inspection sheet, because the addition of a photograph allows the user to recognize the anomaly, its severity and location, and conversion to PDF format enables the user to save the inspection form in a universal format.

Look at the web-site of the Guarantee project if you want to know more about Energy Performance Contracting



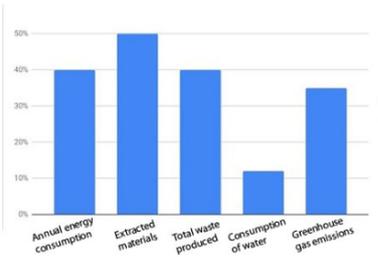
**BIM Training for technicians**

**Indice del corso:**

- ▣ Introduction
  - Test
- ▣ Basic BIM knowledge and skills
  - Test
- ▣ Diffuse BIM
  - Apply information management
- ▣ Apply procurement management
  - Test
- ▣ Use BIM technology
  - Sustainable construction sector
  - Laser scanning technology
  - Test
- ▣ Analyse the BIM Model
  - Test

Modulo 6 > Lezione 1  
**Sustainable construction sector**  
**Construction activities and buildings have negative impacts on the environment** because of the land use, the consumption of raw materials, water, the production of energy and waste and the consequent CO2 emissions.

- Globally buildings are responsible for:
- 40 % of annual energy consumption;
  - 50% extracted materials (by weight);
  - 12% of consumption of water;
  - RC&D: 40 % total waste produced (92% demolition and 8% construction);
  - 22% construction and demolition waste (by weight); X 35% greenhouse gas emissions;



- Extracted materials and minerals quarries 30 %; X 30 % - 40 % of CO2 emissions. Households and services are the first emitter of CO2 emissions in EU-15 if the electricity is included in final sectors;
- 42% energy consumption - heating and lighting of buildings accounts for the largest single share of energy use (which 70% is for heating);
- Buildings occupy 10% of the space.

Currently 80% of the European population live in urban areas and people spend more of 90% of their lives within the built environment (considering the home, workplace, school and leisure time).

This environment, therefore construction activities, largely affects the wellbeing and comfort of the people and buildings also have impacts in human health. The Sustainable Development is operated during the whole **life cycle of the building**



- and should:
- ✓ Reduce consumption of resources (save water and energy);
  - ✓ Reuse of resources during the refurbishment or disposal of existing buildings or use of recyclable resources of new buildings. The wrong environmental management of the site encourages the generation of waste that could have been avoided;
  - ✓ Eliminate toxics and ensure the healthiness of buildings, applying nature protection (climate change mitigation, biodiversity, ecosystem services);
  - ✓ Put emphasis on the quality of the buildings, maximising the durability because, in general, it is more sustainable renovate existing buildings than to demolish and build new;
  - ✓ Use eco-efficient materials (without processing) and local materials;
  - ✓ Increase the comfort of life (increase the quality of outdoor areas and indoor air).

**It is widely known that the construction sector is a key sector for achieving sustainable development.**

Because of that, systems for description, quantification, assessment and certification of sustainable buildings have been developed at international level and in Europe. CEN/TC350 "Sustainability of Construction Works" - has the task to establish the European set of rules for sustainability of construction works.

The choice of a building technique, component and construction material is generally based on criteria such as functionality, technical performance, architectural esthetics, economic costs, durability and maintenance. Nevertheless, this choice doesn't have into account the impacts of environment and human health.

**Build sustainably ensure that the social, economic and environmental aspects were taken into account throughout a building's life-cycle**

Refurbishment of housing inevitably leads to the generation of waste due to the demolition work and the construction itself; however, three major **guidelines should be used to limit the quantity of waste taken to the landfill or incinerated:**

- Prevention - limiting construction waste insofar as possible during the works and with regard to the future transformation or demolition of the building;
- Promoting recycling and reuse of demolition waste by sorting the waste on the construction site;
- When recycling is not possible, eliminating in two means: incineration with recovery of energy and taking the waste to the landfill.

**Actions to be taken to limit the impacts on the environment and human health during construction and demolition waste are listed below:**

- ✓ Prefer work with standard dimensions and prefabricated components in the construction process;
- ✓ Prefer mechanical fastening systems (using screws and nails) easy to disassemble and sort, and with a high rate of recycling - avoid fastening systems using glue, cement, welding, and other adhesives;
- ✓ Exclude materials or products from construction generating dangerous waste;
- ✓ Consider the re-use of certain in situ materials, without preliminary treatment;
- ✓ Carefully assess the quantity of waste produced on the construction site (construction and disassembly) per type of materials used, and the quantity of waste produced for the duration of the construction site.

**The people who are most exposed to substances and emissions of these substances are:**

- Workers producing the construction materials
- Workers using the construction materials
- Users of the building
- Workers doing demolition

The primary emissions from materials are high immediately after manufacture, they drop by 60 to 70% in the first six months and by and large disappear entirely one year after they have been incorporated or used (like biocides, fungicides, certain solvents, volatile organic compounds and certain additives). The secondary emissions can persist and even increase over time.

**The integration of sustainable development concept into housing and architecture in general is called Sustainable Construction.**

**The technicians should have a transversal knowledge of all the techniques to improve energy performance of a building in order to suggest the best solution when involved in refurbishment works.**

In the next video you will see the application of BIM to analyze the impact of a new construction in a specific area. From google earth it is possible not only to view the area but also show the impact of the new construction. This use of BIM allows to:

- help the owner to visualize the building in the virtual world before starting the actual construction
- help the authorization body to better identify the impact
- help the constructor to visualize the area and optimize the logistic of the building site
- help the site safety manager to prepare the safety plan
- etc.



[LINK](#) Environmental impact assessment (Minnucci Associati srl partner IBIMI)

BIM Training for technicians  
 Modulo 6 > Lezione 1  
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**BIM Training for technicians**

Modulo 7 > Lezione 1

**Simulation techniques and energy and lighting analysis**

IT'S VERY IMPORTANT TO DEFINE THE REQUIREMENTS FOR ENERGY PERFORMANCES SINCE THE DESIGN PHASE FOR BOTH NEW AND EXISTING BUILDINGS AND TO IDENTIFY THE DATA NEED FOR THE CORRECT SIMULATION OF THE ENERGY PERFORMANCE

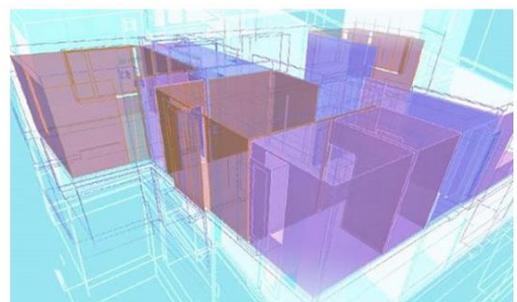
Source: www.enea.it

**Indice del corso:**

- Introduction [Test](#)
- Basic BIM knowledge and skills [Test](#)
- Diffuse BIM [Test](#)
- Apply information management [Test](#)
- Apply procurement management [Test](#)
- Use BIM technology [Test](#)
- Analyse the BIM Model [Test](#)
- Simulation techniques and energy and lighting analysis [Test](#)
- BIM for handover and maintenance [Test](#)
- Training on Energy Efficiency [Test](#)

- **Energy Models:** These building information-modelling models deal with all the big questions. You'll often use an energy model at the earliest stages of your analysis. The energy model helps you to interpret the basic information. You'll figure out what you need to know about your structure's form and orientation at this stage. Often, you'll only use basic geometry to build your models. More realistic and defined specifications come with later energy models.
- **Lighting Models:** These are all about the presentation because the lighting model handles the visual aspect. They tend to contain much more detail than energy models. You'll touch up your geometry and use this model to define the properties of your materials. This is the model that helps you to figure out exactly what you need, as well as how everything should fit together. Generally, your finished lighting model is similar to the one you'll present to clients. When imported into the energy simulation tool, the model would assume the default values for the location given when creating the digital model. In order to discern that the information related to the selected material used in the model has been completely transmitted over to the energy simulation and analysis tools, a new material could be assigned to the 3D model of the building. The basic requirements for lighting analysis and design are highlighted in the following:
  - Spatial geometry;
  - Surface reflectance;
  - Luminaire photometry and associated factors;
  - Luminaire position and aiming.

For any building the use for the different "zones" need to be identified to establish the foreseen temperature, the number of air exchange, etc. besides the thermal transmittance of each wall, ceiling, pavement, window, door, etc. need to be known. The more these data are reliable the better will be the simulation. Especially in the case of existing building, it is very important to know the habit of the tenants so that the simulation can be performed in the correct way.

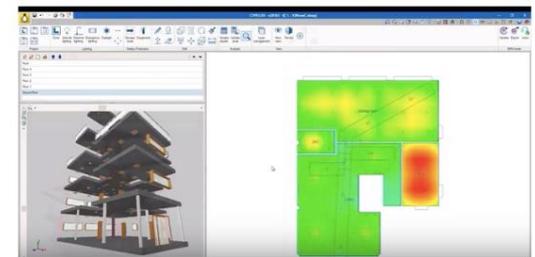


Source: www.enea.it

The final design will be influenced by:

- the results of the energy and lighting analysis,
- the LCA and Environmental Impact and embodied energy results,
- the sustainability evaluation of every building component based on the LEED rating system,
- the initial costs of all the components.

The newest feature is the ability to calculate light levels in a space from the sunlight and skylight at a given day and time. All-Weather Sky method, uses historical weather data to better approximate the sky conditions for the selected day and time. In the video, made by Cype, it is possible to visualize the BIM lighting design with Revit and CYPE software.



In the video, at the link below, an application of BIM to model the lighting system is showed:

[LINK](#) [BIM lighting design](#)

BIM Training for technicians

Modulo 7 > Lezione 1

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Screen capture of the test questions example in Italian and English language is shown below:

**BIM formazione per tecnici**

\* ATTENZIONE: per ogni domanda è necessario rispondere ad ogni singola risposta (VERO o FALSO)  
\* NOTE: for each question you need to mark every single answer (TRUE - FALSE)

Introduzione

1) Come il processo BIM può contribuire ad incrementare l'efficiamento energetico? **False True**

- Building Information Modelling, assicura sia la progettazione di un nuovo edificio che la restituzione dell' "as built"
- Building Information Modelling implementa solo la progettazione di nuovi edifici
- Building Information Modelling sviluppa un modello virtuale e consente un'analisi accurata dell'energia durante il ciclo di vita dell'edificio

2) Qual è il ruolo dei tecnici nel processo BIM? **False True**

- I tecnici avranno l'obbligo previsto dalla normativa di utilizzo di un tablet per il monitoraggio
- I tecnici intervengono specialmente nella fase di manutenzione
- I tecnici devono conoscere il linguaggio BIM, assicurare (direttamente o indirettamente) l'upload delle informazioni degli impianti/componenti installati nel modello BIM per garantire che tutte le informazioni relative alla manutenzione e alla fine del ciclo di vita dell'edificio siano inserite correttamente.

3) Qual è l'obiettivo del progetto Net-Ubiep? **False True**

- Net Ubiep è un progetto Europeo e promuove degli standard Europei
- Net Ubiep ha come obiettivo l'incremento dell'efficienza energetica degli edifici mediante l'utilizzo del BIM durante l'intero ciclo di vita dell'edificio
- Net Ubiep ha come obiettivo promuovere servizi specializzati per l'efficienza energetica

4) Cosa viene richiesto ad un tecnico nel processo BIM? **False True**

- solamente l'esecuzione delle istruzioni del costruttore
- solamente l'esecuzione delle istruzioni del produttore per l'installazione dei componenti
- provvedere alla gestione del modello BIM, con tutte le informazioni necessarie per l'installazione e la manutenzione dei componenti installati

**BIM Training for technicians**

\* ATTENZIONE: per ogni domanda è necessario rispondere ad ogni singola risposta (VERO o FALSO)  
\* NOTE: for each question you need to mark every single answer (TRUE - FALSE)

Basic BIM knowledge and skills

1) What is the importance of BIM? **False True**

- Information is continuously updated and linked to model 3d to allow the increase of energy performance during the life cycle of the building
- Information are collected in a separated dataset so that can be consulted easily
- BIM process 3d model is most important, information are only an addendum

2) What is "EU Ecolabel"? **False True**

- It is a type of BIM model use
- It's a voluntary standard
- It's an IFC format

3) How do you define interoperability? **False True**

- A process that allows implementation of market transparency and environmental benefits
- The system which allows the exchange of files among any professionals without any manual operations
- Process that reduces collaboration between stakeholders

4) "Data security is first of all" is one of the six keys of...? **False True**

- Interoperability process
- Data exchange among different stakeholders
- EU Ecolabel



Screen capture of the recorded video lessons in Italian language is shown below:



### 2.3.3 Course description and results

Net-UBIEP Training course for Technicians was held in Torino, Italy on the following dates:

| Course code  | Course instructor            | Dates  | Number of participants |
|--------------|------------------------------|--|------------------------|
| BIM-001-18   | Prof.ssa Rosella Seren Rosso | February 9 <sup>th</sup> 2018<br>February 23 <sup>rd</sup> 2018<br>March 2 <sup>nd</sup> 2018<br>March 9 <sup>th</sup> 2018<br>March 23 <sup>rd</sup> 2018<br>April 3 <sup>rd</sup> 2018<br>May 11 <sup>th</sup> 2018<br>May 18 <sup>th</sup> 2018 | 18                     |
| BIM-001A-18  | Prof. Remo Vacca             | February 9 <sup>th</sup> 2018<br>February 23 <sup>rd</sup> 2018<br>March 2 <sup>nd</sup> 2018<br>March 9 <sup>th</sup> 2018<br>March 23 <sup>rd</sup> 2018<br>April 3 <sup>rd</sup> 2018<br>May 11 <sup>th</sup> 2018<br>May 18 <sup>th</sup> 2018 | 20                     |
| BIM-002A-19  | Prof.ssa Rosella Seren Rosso | September 30 <sup>th</sup> 2019<br>October 7 <sup>th</sup> 2019<br>October 14 <sup>th</sup> 2019   | 25                     |
| BIM-002B-19  | -                            | October 3 <sup>rd</sup> 2019<br>October 10 <sup>th</sup> 2019<br>October 17 <sup>th</sup> 2019   | 21                     |
| <b>TOTAL</b> |                              |  | <b>84</b>              |



Courses were held by project partner Gruppo CS in cooperation with Institute of Higher Education "Erasmus da Rotterdam". The title of courses was: "INTRODUCTORY COURSE BIM (Building Information Modelling)". The duration of the 2018 course was 16 hours of lectures, while both 2019 courses were 12 hours long in total.

Several photos from the courses for technicians conducted by **Gruppo CS** can be found bellow.



2.3.4 Agenda

2018 courses

| GRUPPO CS<br>consulenza&formazione   |  | PROGRAMMAZIONE DEL PROGETTO FORMATIVO / ORIENTATIVO  |     |     |     |   |     |                              |     |  |     | Sistema Gestione Qualità<br>Rev. 03 del 02/10/2017 |          |               |   |         |                               |     |         |
|--|--|--|-----|-----|-----|---|-----|------------------------------|-----|--|-----|--|----------|---------------|---|---------|-------------------------------|-----|---------|
| SEDE CORSO:<br>cio Istituto d'Istruzione Superiore "Erasmus da Rotterdam"<br>Via XXV Aprile 139 - 10042 Nichelino (TO) |  | Gantt Progettazione Progetto Formativo / Orientativo:<br>CORSO INTRODUTTIVO BIM<br>(Building Information Modeling) |     |     |     | Data apertura:<br>09/02/2018                        |     | Data chiusura:<br>11/05/2018 |     | <input type="checkbox"/> MACRO<br><input type="checkbox"/> MICRO |     | Codice Corso:<br>2018                              |          |               |   |         |                               |     |         |
| DESCRIZIONE  | Orario   | ANNO 2018  |     |     |     |   |     |                              |     |  |     |  | DISPENSE | T             | P | DOCENTE |                               |     |         |
|  |  | GEN  | FEB | MAR | APR | MAG   | GIU | LUG                          | AGO | SET  | OTT |  |          |               |   |         |                               |     |         |
| <b>INTRODUZIONE AL BIM</b>   |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| FASE 1   | Presentazione corso  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | BIM quale risolutore di Problemi                                 | 10.00-12.00  |     | 9   |     |   |     |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
|  | La Gestione delle Informazioni                                   |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | La Progettazione Collaborativa                                   | 10.00-12.00  |     | 23  |     |   |     |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
| <b>LA PROGETTAZIONE BIM</b>  |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| FASE 2   | Benefici del BIM   |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Utilizzo degli strumenti e software per la progettazione BIM     |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Infrastruttura per la Progettazione                              | 10.00-12.00  |     |     | 2   |   |     |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
|  | Metodologia di Scambio Dati: Formato Aperto IFC                  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Scambio Informativo per uso e manutenzione del Costruito         | 10.00-12.00  |     |     | 9   |   |     |                              |     |  |     |  |          |               |   |         | ESERCITAZIONE/SI<br>MULAZIONE | 2 0 | MANCINI |
| FASE 3   | Sistemi di Classificazione                                       |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Introduzione ad ARCHICAD: installazione e utilizzo del programma | 10.00-12.00  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Risorse Umane BIM  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   |     |         |
| FASE 4   | Casi di studio ed esercitazioni di modellazione con ARCHICAD     | 10.00-12.00  |     |     | 23  |   |     |                              |     |  |     |  |          |               |   |         | ESERCITAZIONE/SI<br>MULAZIONE | 2   | MANCINI |
|  | <b>LE FIGURE PROFESSIONALI DEL BIM</b>                           |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| FASE 3   | BIM Manager  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | BIM Coordinator  | 10.00-12.00  |     |     |     | 6   |     |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
|  | BIM Specialist   |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| <b>L'EVOLUZIONE NORMATIVA IN ITALIA</b>  |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| FASE 4   | Normativa UNI 11337:2017   |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  | Normativa CEN / TC 442   | 10.00-12.00  |     |     |     |   | 4   |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
|  | La nuova normativa ISO 19650:2017                                | 10.00-12.00  |     |     |     |   | 11  |                              |     |  |     |  |          |               |   |         | IN CONSEGNA                   | 2 0 | MANCINI |
| <b>TEST DI VERIFICA FINALE</b>   |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
|  |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   | TOTALE  | 16                            |     |         |
| (Spazio riservato a Note)  |  |  |     |     |     |   |     |                              |     |  |     |  |          |               |   |         |                               |     |         |
| DATA COMPILAZIONE<br>19/04/2018  |  | FIRMA RESPONSABILE PROGETTO FORMATIVO<br>N. PANASYUK   |     |     |     | FIRMA ANALISI DEI FABB. E MACROPROG.<br>N. PANASYUK |     |                              |     | FIRMA MICROPROG./PIANIFICAZ./PROGRAM.<br>M. SANFILIPPO           |     |  |          | FOGLIO<br>1/1 |   |         |                               |     |         |



|  |  |  |
|--|--|--|
|  | <b>PROGRAMMAZIONE DEL PROGETTO FORMATIVO / ORIENTATIVO</b> | Sistema Gestione Qualità<br>Rev. 03 del 02/10/2017 |
|--|--|--|

|  |   |  |  |                              |
|--|---|--|--|------------------------------|
| SEDE CORSO:<br>o/o Istituto d'Istruzione Superiore "Erasmus da Rotterdam"<br>Via XXV Aprile 139 - 10042 Nichelino (TO) | Gantt Progettazione Progetto Formativo / Orientativo:<br><b>CORSO INTRODUTTIVO BIM</b><br>(Building Information Modeling) | Data apertura: 09/02/2018<br>Data chiusura: 11/05/2018 | <input type="checkbox"/> MACRO<br><input type="checkbox"/> MICRO | Codice Corso:<br><b>2018</b> |
|--|---|--|--|------------------------------|

| DESCRIZIONE  | Orario      | ANNO 2018 |     |     |     |     |     |     |     |     |     |     |     | DISPENSE | T | P | DOCENTE |             |   |   |         |             |                               |   |         |         |
|--|-------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|---|---|---------|-------------|---|---|---------|-------------|-------------------------------|---|---------|---------|
|  |             | GEN       | FEB | MAR | APR | MAG | GIU | LUG | AGO | SET | OTT | NOV | DIC |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| <b>INTRODUZIONE AL BIM</b>                                       |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Presentazione corso  |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| BIM quale risolutore di Problemi                                 | 12.00-14.00 |           | 9   |     |     |     |     |     |     |     |     |     |     |          |   |   |         | IN CONSEGNA | 2 | 0 | MANCINI |             |                               |   |         |         |
| La Gestione delle Informazioni                                   |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| La Progettazione Collaborativa                                   |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Concetti base di Modellazione                                    | 12.00-14.00 |           | 23  |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         | IN CONSEGNA | 2                             | 0 | MANCINI |         |
| Benefici del BIM   |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| <b>LA PROGETTAZIONE BIM</b>                                      |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Utilizzo degli strumenti e software per la progettazione BIM     |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Infrastruttura per la Progettazione                              | 12.00-14.00 |           |     | 2   |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | IN CONSEGNA                   | 2 | 0       | MANCINI |
| Metodologia di Scambio Dati: Formato Aperto IFC                  |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Scambio Informativo per uso e manutenzione del Costruito         |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Sistemi di Classificazione                                       | 12.00-14.00 |           |     | 9   |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | ESERCITAZIONE/SI<br>MULAZIONE | 0 | 2       | MANCINI |
| Introduzione ad ARCHICAD: installazione e utilizzo del programma |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Risorse Umane BIM  |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | IN CONSEGNA                   |   |         |         |
| Casi di studio ed esercitazioni di modellazione con ARCHICAD     | 10.00-12.00 |           |     | 23  |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | ESERCITAZIONE/SI<br>MULAZIONE | 2 |         | MANCINI |
| <b>LE FIGURE PROFESSIONALI DEL BIM</b>                           |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| BIM Manager  |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| BIM Coordinator  | 12.00-14.00 |           |     |     | 6   |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | IN CONSEGNA                   | 2 | 0       | MANCINI |
| BIM Specialist   |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| <b>L'EVOLUZIONE NORMATIVA IN ITALIA</b>                          |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Normativa UNI 11337:2017   |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| Normativa CEN / TC 442   | 12.00-14.00 |           |     |     |     |     | 4   |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | IN CONSEGNA                   | 2 | 0       | MANCINI |
| La nuova normativa ISO 19650:2017                                |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
| TEST DI VERIFICA FINALE  | 12.00-14.00 |           |     |     |     |     | 11  |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             |                               |   |         |         |
|  |             |           |     |     |     |     |     |     |     |     |     |     |     |          |   |   |         |             |   |   |         |             | TOTALE                        |   | 16      |         |

(Spazio riservato a Note)

|                                 |  |   |  |               |
|---------------------------------|--|---|--|---------------|
| DATA COMPILAZIONE<br>19/04/2018 | FIRMA RESPONSABILE PROGETTO FORMATIVO<br>N. PANASYUK | FIRMA ANALISI DEI FABB. E MACROPROG.<br>N. PANASYUK | FIRMA MICROPROG./PIANIFICAZ./PROGRAM.<br>M. SANFILIPPO | FOGLIO<br>1/1 |
|---------------------------------|--|---|--|---------------|

2019 courses – Group A



NET-UBIEP | Network for Use BIM  
to Increase Energy Performance



### CALENDARIO CLASSE 5°

- DATE CORSO: 30/09/2019 – 07/10/2019 – 14/10/2019
- SEDE CORSO: ISTITUTO SUPERIORE ERASMO DA ROTTERDAM – Via XXV Aprile 139 – Nichelino (TO)
- PERSONA DI RIFERIMENTO:  
Arch. Seren Rosso Rosella  
Mail: [studioarcrosso@tiscali.it](mailto:studioarcrosso@tiscali.it)  
Telefono: 3933317751

Network for Using BIM to Increase the Energy Performance

Grant Agreement Number: 754016  
Net-UBIEP H2020

[www.net-ubiep.eu](http://www.net-ubiep.eu) - [netubiep.project@net-ubiep.eu](mailto:netubiep.project@net-ubiep.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



NET-UBIEP | Network for Use BIM  
to Increase Energy Performance



| Orario        | 30/09/2019 Argomenti  | Docente        |
|---------------|---|----------------|
| 14:30 – 15:00 | ACCOGLIENZA PARTECIPANTI e PRESENTAZIONE CORSO  | VERSATI DONATO |
| 15:00 – 16:00 | 1- INTRODUZIONE AL BIM<br>2- EVOLUZIONE DELLA PROGETTAZIONE DAL TECNIGRAFO AL CONCETTO DI BIM | VERSATI DONATO |
| 16:00 – 16:15 | Pausa   |                |
| 16:15 – 17:30 | 3- FIGURE PROFESSIONALI LEGATE AL BIM   | VERSATI DONATO |

| Orario        | 07/10/2019 Argomenti                 | Docente                             |
|---------------|--------------------------------------|-------------------------------------|
| 14:30 – 16:00 | 4- CENNI SULLA NORMATIVA UNI 11337-7 | VERSATI DONATO                      |
| 16:00 – 16:15 | Pausa                                |                                     |
| 16:15 – 17:30 | 5- INTRODUZIONE AI CASI PRATICI      | VERSATI DONATO/<br>BOCCUZZI MARTINA |

| Orario        | 14/10/2019 Argomenti  | Docente                             |
|---------------|---|-------------------------------------|
| 14:30 – 16:00 | 6- PANORAMICA SUI SOFTWARE BIM                                  | VERSATI DONATO/<br>BOCCUZZI MARTINA |
| 16:00 – 16:15 | Pausa   |                                     |
| 16:15 – 17:30 | 7- INTRODUZIONE AL SOFTWARE ARCHICAD<br>TEST DI VERIFICA FINALE | VERSATI DONATO/<br>BOCCUZZI MARTINA |

[www.net-ubiep.eu](http://www.net-ubiep.eu) - [netubiep.project@net-ubiep.eu](mailto:netubiep.project@net-ubiep.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



2019 courses – Group B



## CALENDARIO CLASSE 4°

- DATE CORSO: 30/09/2019 – 07/10/2019 – 14/10/2019
- SEDE CORSO: ISTITUTO SUPERIORE ERASMO DA ROTTERDAM – Via XXV Aprile 139 – Nichelino (TO)
- PERSONA DI RIFERIMENTO:  
Arch. Seren Rosso Rosella  
Mail: [studioarcrosso@tiscali.it](mailto:studioarcrosso@tiscali.it)  
Telefono: 3933317751

Network for Using BIM to Increase the Energy Performance

Grant Agreement Number: 754016  
Net-UBIEP H2020

[www.net-ubiep.eu](http://www.net-ubiep.eu) - [netubiep.project@net-ubiep.eu](mailto:netubiep.project@net-ubiep.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



| Orario        | 03/10/2019 Argomenti  | Docente        |
|---------------|---|----------------|
| 14:30 – 15:00 | ACCOGLIENZA PARTECIPANTI e PRESENTAZIONE CORSO  | VERSATI DONATO |
| 15:00 – 16:00 | 1- INTRODUZIONE AL BIM<br>2- EVOLUZIONE DELLA PROGETTAZIONE DAL TECNIGRAFO AL CONCETTO DI BIM | VERSATI DONATO |
| 16:00 – 16:15 | Pausa   |                |
| 16:15 – 17:30 | 3- FIGURE PROFESSIONALI LEGATE AL BIM   | VERSATI DONATO |

| Orario        | 10/10/2019 Argomenti                 | Docente                             |
|---------------|--------------------------------------|-------------------------------------|
| 14:30 – 16:00 | 4- CENNI SULLA NORMATIVA UNI 11337-7 | VERSATI DONATO                      |
| 16:00 – 16:15 | Pausa                                |                                     |
| 16:15 – 17:30 | 5- INTRODUZIONE AI CASI PRATICI      | VERSATI DONATO/<br>BOCCUZZI MARTINA |

| Orario        | 17/10/2019 Argomenti  | Docente                             |
|---------------|---|-------------------------------------|
| 14:30 – 16:00 | 6- PANORAMICA SUI SOFTWARE BIM                                  | VERSATI DONATO/<br>BOCCUZZI MARTINA |
| 16:00 – 16:15 | Pausa   |                                     |
| 16:15 – 17:30 | 7- INTRODUZIONE AL SOFTWARE ARCHICAD<br>TEST DI VERIFICA FINALE | VERSATI DONATO/<br>BOCCUZZI MARTINA |

[www.net-ubiep.eu](http://www.net-ubiep.eu) - [netubiep.project@net-ubiep.eu](mailto:netubiep.project@net-ubiep.eu)

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## 2.4 Lithuania

### 2.4.1 E-course description

The Lithuanian E-learning course is designed to be freely available for all interested parties (with a mandatory free registration) and was designed with a total estimated workload of 24 hours for the learners.

The Lithuanian partners opted to develop asynchronous online teaching content with the goal to provide learners the opportunity to follow the lessons independently of teachers (e-learning administrator's) activities at any time they wish, and as many times they need to do it to gain knowledge and skills. Learners can study and learn at their own pace and reinforce concepts through further reading or other online material such as models or simulations.

For E-Learning courses for professionals the Moodle platform was launched in Vilnius Gediminas Technical University (<http://skst.vgtu.lt/>).

### 2.3.2 Functionalities and features of the e-learning platform

To access the Lithuanian Net-UBIEP e-learning course click here: <http://skst.vgtu.lt/>





The Lithuanian Net-UBIEP e-learning course is characterised by extensive use of pdf presentations on BIM, energy efficiency and NZEB with several tasks for learners.

The main page of a course (content and features) is shown in the figures below:



The Moodle course contains six Modules presented in Training material for Technicians and includes real case studies accessed through BIM project management web platform BIMSinc.

In total 6 modules of Net-UBIEP course were developed in Lithuania as follows:

- Introductory module - basic BIM knowledge and skills
- Module 1 - BIM Dissemination
- Module 2 - Information Management Applications
- Module 3 - Procurement Management
- Module 4 - Using BIM Technologies
- Module 5 - BIM Model Analysis

Screen capture of the test questions example in Lithuanian language is shown below:





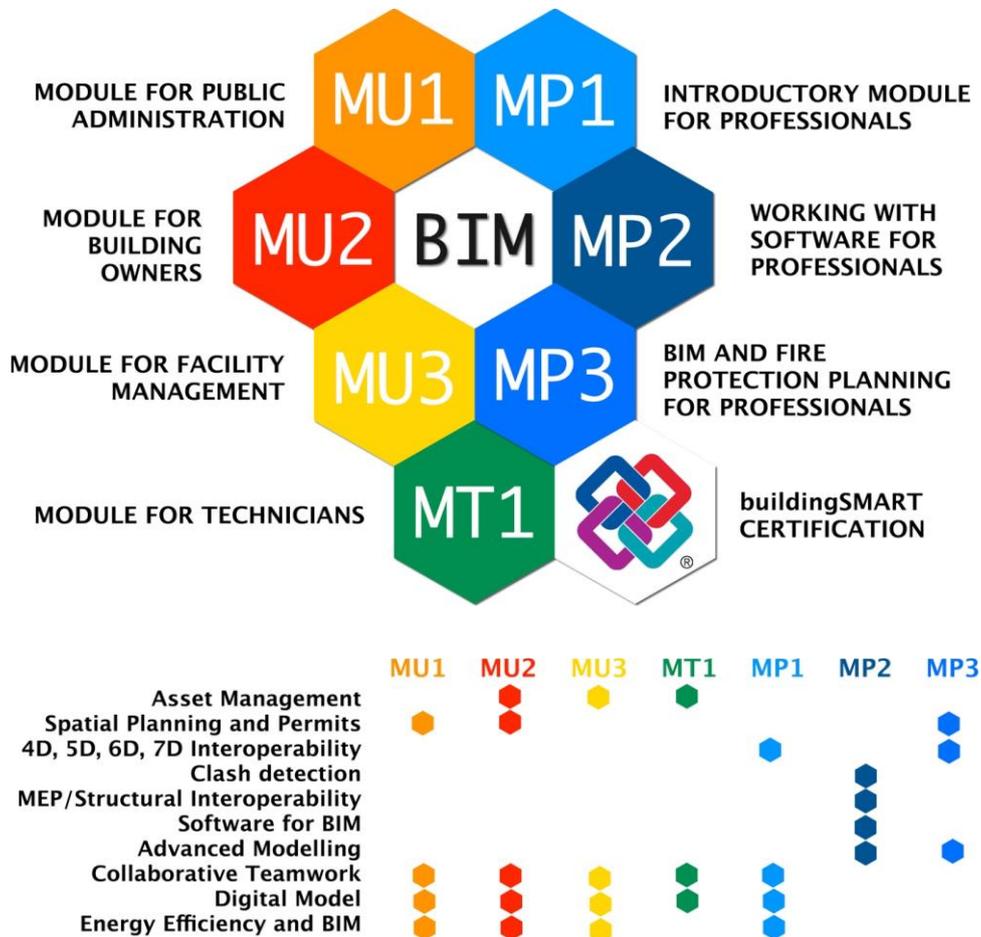
## 2.5 Slovakia

### 2.5.1 E-course description

E-learning has been available from 1 June 2019 accessible through Net-UBIEP web-site. The e-learning follows the publication Net-UBIEP Training Material for technicians, Net-UBIEP project 2018. The e-learning platform is a public area of the website, accessed by all interested users, and provides online training for technicians and educational material, structured under specific topics.

E-learning is freely available only after completing the application form. After completing the application form, learners will then receive an access link to the e-learning page:

The training for technicians is offered as module MT1 of the training scheme established by the project (Net-Ubiep BIM Academy). The structure of the modules and sub-modules of the training provided by the scheme is illustrated in the following picture:



MT-1 module covers learning outcomes from the 3D Net-UBIEP competence model assigned to technicians:

- LO1: Identify the advantages of using BIM during the life cycle of the buildings and evaluate related BIM technologies;

- LO2: List several stakeholders who participate in the sustainable construction project, distinguishing their role and needs;
- LO3: Distinguish between different RES solutions and technologies and select products that fit specifications, avoiding interferences with other technologies installed;
- LO4: Provide maintenance information to preserve the foreseen energy performance, assuring the completeness and correctness of the plan;
- LO5: Evaluate the completeness of the handover strategy and verify the correspondence between the “as built” and the final BIM model of the building.

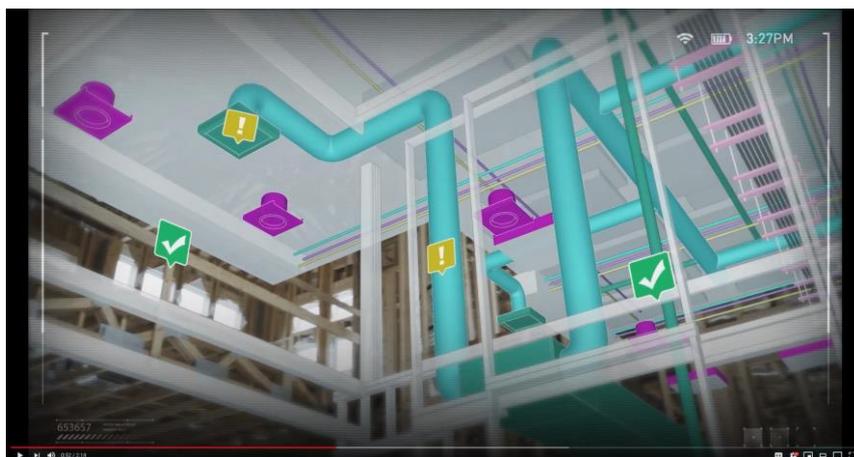
The training scheme was set up as an open system to which new modules will be added as the needs for training of technicians will develop.

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Taking into account the experience of UVS, the Slovak partners developed and offer an in-class module for technicians that precedes the use of the e-learning. This is to attract technicians to applications supported by BIM engine through direct demonstration of the tools and providing ability to try them in practice in relevant environments. No online content can offer such experience that would motivate technicians to learn more on tools enabled by digitalisation in the construction sector.

The in-class training introduction is focused on selected three areas in which technicians are expected to intervene, where BIM and BIM driven mixed reality helps in performing their tasks:

- Installation of equipment in near-Zero Energy Buildings relevant to achieving/impacting the targeted energy performance of buildings;
- Installation of new equipment in delivering energy renovation of existing buildings;
- Facility management – regular maintenance of buildings and its equipment impacting achieving the projected energy performance of the buildings.



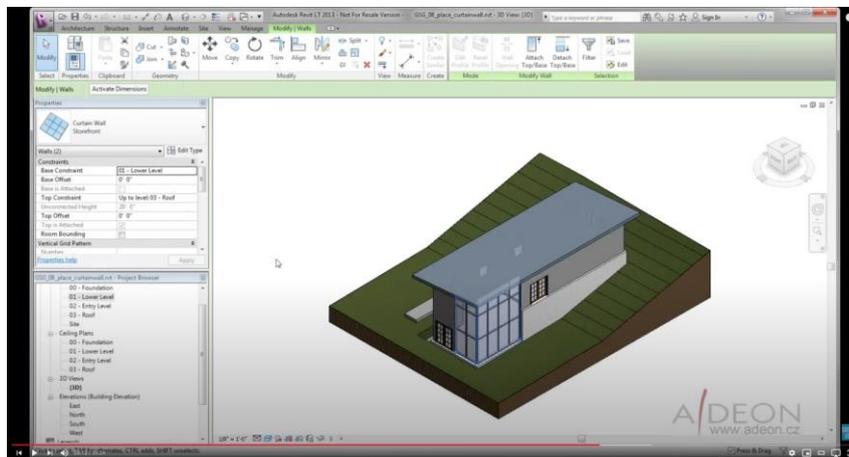
Tabuľka LOD: Rôzne úrovne detailov v stavebnom sektore v rôznych krajinách:

| Holandský (brazdňný)     | RIBA   | Denmark | USA (AIA)     | CityGML              | NEN 2089      | NEN 2574   |
|--------------------------|--------|---------|---------------|----------------------|---------------|--|
| Program: požiadaviek     | Fáza 1 | Level 0 | -             | LOD 0/1              | Level 1, 2, 3 | Fáza 1, 2 a 3 (Iniciácia, štúdie uskutočniteľnosti a definícia projektu) |
| Návrh/ konštrukčný návrh | Fáza 2 | Level 1 | LOD 100       | LOD 2                | Level 3,4     | Fáza 4 (Konštrukčný návrh)   |
| Prôchodný návrh          | Fáza 3 | Level 2 | LOD 200       | LOD 3                | Level 4, 5    | Fáza 5 (Prôchodný návrh)   |
| Konštrukčný návrh        | Fáza 4 | Level 3 | LOD 250 / 300 | LOD 4                | Level 4,5     | Fáza 6 (Konštrukčný návrh)   |
| Kontrakt                 | Fáza 4 | Level 4 | LOD 300 / 400 | LOD 4 (env. met ADE) | Level 5, 6    | Fáza 7 (Kontrakt)  |
| Prípravná práca          | Fáza 5 | Level 5 | LOD 400 / 450 | -                    | -             | Fáza 9 (Prípravná práca)   |
| Realizácia               | Fáza 5 | Level 6 | LOD 400 / 450 | -                    | Level 5, 6    | Fáza 10 (Realizácia)   |
| As built                 | Fáza 6 | -       | LOD 500       | -                    | -             | Fáza 11 (Dodanie projektu)   |
| Využitie                 | Fáza 7 | -       | -             | -                    | -             | -  |
| Demolícia                | -      | -       | -             | -                    | -             | -  |

Použitie mřížok v určitých fázach výstavby je vopred prediktorované stavebným tímom a zaznamenané v pláne spolupráce projektu. Očividne také, že každá disciplína musí byť v danom čase na rovnakej úrovni jednotnosti. To závisí od dohody uzavretej medzi partnermi. Samozrejme, toto musí byť jasné pre kalendár člena BIM, ktorý v určitej dobe dodáva určitú disciplínu.

Koncept je možné použiť samostatne mřížku ako postupne zavedenie projektu BIM. Súčasný stavebný a inžiniersky tím častokrát nepozná toto špecifické na detailnej úrovni. Podrobný príklad technickej inštalácie je uvedený na obrázku.

Príklad úrovne detailu/vývoja



### 2.5.2 Course description and results

On **28 March 2019**, Net-UBIEP Training course for Technicians was held in Bratislava, Slovakia. As explained earlier, Slovak partners decided to develop module for technicians (now module MT1 offered by the Net-Ubiep BIM Academy in Slovakia for companies and SMEs) and organised a 5 hours long in-class training for technicians, as reading the information material using e-learning would be not enough for them and Slovak partners were delivering through this session practical demonstrations for augmented reality using phones, tablets and 3D-glasses; and they could personally test working with 3D-glasses (this exercise was prepared by a company affiliated to the school. At this stage, the availability of the equipment for using 3D visualisation technology (e.g. 3D-glasses) are not readily available in Slovakia. Nevertheless, the Slovak partners plan developing online training module with using 3D-glasses for technicians in companies, which are able providing similar training online. This will, however, be subject of another project.

A group of **35 participants** (technicians) had undertaken the classroom course in Slovakia within the framework of the Net-UBIEP project.

The key objectives of the seminar are:



- Present key elements of BIM and train technicians using the relevant applications based on BIM as digital and information engine (VR and AR);
- Explain how to use the available tools in delivery stage and in facility management (installations, servicing, repairs etc.);
- Discuss the barriers in efficient and effective use of BIM by technicians.

Main topics, focus which were discussed in more detail:

- How BIM helps the target group in achieving the targeted energy performance of the building during the relevant (to the target group) phases of the building's life cycle;
- What tools the target groups need to master in order to reap the benefits of BIM;
- Digitalised building model and how to work with it in performing the target groups' duties and responsibilities;
- Infrastructure and training needed for the target groups to perform their duties and responsibilities.

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Several photos from the course for technicians conducted by **ViaEuropa Competence Centre and UVS** can be found bellow.

Following the in-class training, the participants registered for e-learning to follow the content prepared by the project in detail and illustrative videos, schemes and other material.



### 2.5.3 Agenda

#### 4.1 In-class session

28 March 2019, Coneco/Racioenergia International Fair grounds / Programme Centre D,  
Bratislava, Slovakia

| Time  | Agenda Item  | Methodology   |
|-------|--|---|
| 09:00 | <b>Introduction to the agenda</b> <ul style="list-style-type: none"> <li><i>Marta Minarovičová (UVS)</i></li> </ul>  | Oral presentation   |
| 09:20 | <b>Use of BIM by technicians in construction stage and facility management</b> <ul style="list-style-type: none"> <li><i>František Doktor (ViaEuropa)</i></li> </ul> | Video presentations with commentary   |
| 10:30 | <b>Practical presentation of a digital model of the building</b> <ul style="list-style-type: none"> <li><i>Juraj Gall (UVS)</i></li> </ul>                           | Digital model demonstration   |
| 11:30 | <b>Using Virtual Reality and Augmented Reality by technicians and craftsmen</b> <ul style="list-style-type: none"> <li><i>Martin Maťašovský (UVS)</i></li> </ul>     | Each participant is provided with possibility to use 3D glasses to see the building (VR) and move in the model and to see and move in the exhibition area (AR) with added installations graphically by specially developed model for the presentation. Participants shared with the others their experiences. |
| 14:00 | <b>End of the training session</b> <ul style="list-style-type: none"> <li><i>Marta Minarovičová (UVS)</i></li> </ul>   | Oral summary  |

## 2.6 Spain

### 2.6.1 Methodology of the courses

The duration of the courses differs from one course to another, minimum of 15 hours and maximum of 100 hours. The courses contain video tutorials that will develop the theoretical contents of the training action and will be uploaded to the Campus along its duration.

They also content exercises: two practical test activities will be carried out during the duration of the course and teachers will resolve all the doubts in the forum enabled for it.

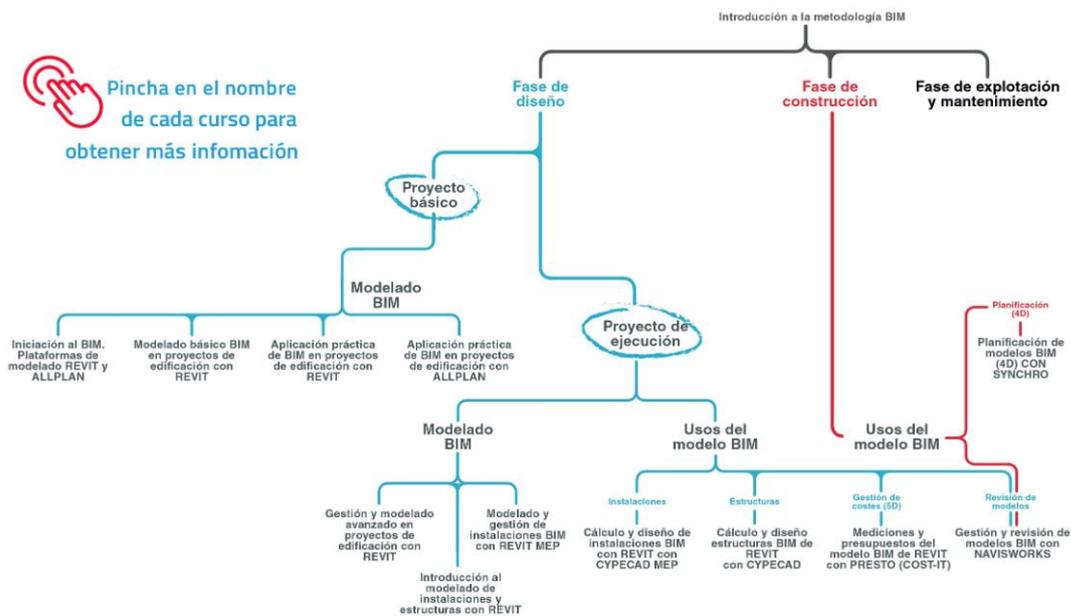
### 2.6.2 Material of the courses

- Student guide.
- Video-tutorials.
- Summary guide for monitoring each unit.
- Materials of the project NET-UBIEP

### 2.6.3 Certification

At the end of the training the student will receive by e-mail if he/she has been qualified as PASS a diploma accrediting the training carried out, issued by the Construction Labour Foundation. In the event of not passing the course, the student will receive, also by e-mail, a certificate of participation in the course if the student has satisfied at least 75 % of the evaluation requirements.

Below there is an organigram of all the courses available on the foundation related to BIM



As an example one of the courses i.e. **Introducción to BIM** will be explained.



Target groups:

Promoters, designers, builders, administrations, qualified professionals and qualified technical personnel: architects, engineers, technical architects and quantity surveyors, technical engineers, senior project technicians, draughtsmen, or any other professional who develops his activity within the construction industry and has interest in acquiring basic introductory knowledge of the BIM methodology.

Objectives:

General objectives:

The main objective of this course is that the student acquires the necessary knowledge to have a global vision and an introduction to the BIM methodology.

Specific objectives:

- Know what BIM is, its basis and advantages, the differences with the traditional CAD and its application on the different areas and phases of the project.
- know about its use in building and civil works and infrastructures, and its use by professionals and companies.
- Be aware of the main BIM modeling programs and some of those that allow to solve other phases of the project.
- know the possible ways of using BIM standards that favor the interoperability between the diverse software.
- Assess the current BIM scenario in some countries, the current situation of the adoption of the methodology in Spain, and the work of the BIM Commission.
- know some first advices to initiate in the application of BIM.

CONTENTS

- UD.1 WHAT IS BIM? Definition of B.I.M. (Building Information Modeling) - BIM Methodology vs. traditional CAD - BIM in the different phases of the project - BIM dimensions - BIM detail levels.
- UD.2 POSSIBLE USERS OF BIM. Application of BIM in building, civil works and infrastructure projects - BIM for project professionals - BIM for construction companies and others - BIM for manufacturers.
- UD.3 BIM IN THE DESIGN PHASE. Architectural modelling - Energy evaluation and modelling of MEP installations - Structural modelling. Model Review - Measurements and Budgets.
- UD.4 BIM IN THE CONSTRUCTION PHASE. Virtual planning of BIM models - Quality control and execution on the model - As built models.
- UD.5 BIM IN THE MAINTENANCE PHASE. The BIM model at the service of building management - The BIM as a living model. From BIM to AIM.
- UD.6 COLLABORATIVE WORK. Standards: BIM Guides and classification systems - The importance of nomenclature in the parametric world - Processes and workflows - Common Collaborative Environment (CDE).
- UD.7 ADVANTAGES AND CHALLENGES TO THE USE OF BIM. Changes in the way we work with BIM - Challenges - Myths - Will the whole sector use BIM?
- UD.8 BIM STRATEGY IN THE WORLD. BIM Scenario in some countries - Current situation in Spain - The BIM Commission.
- UD.9 WHERE TO START WITH THE BIM? Practical advice.
- UD.10 BIM TERMINOLOGY Glossary of BIM specific terms.

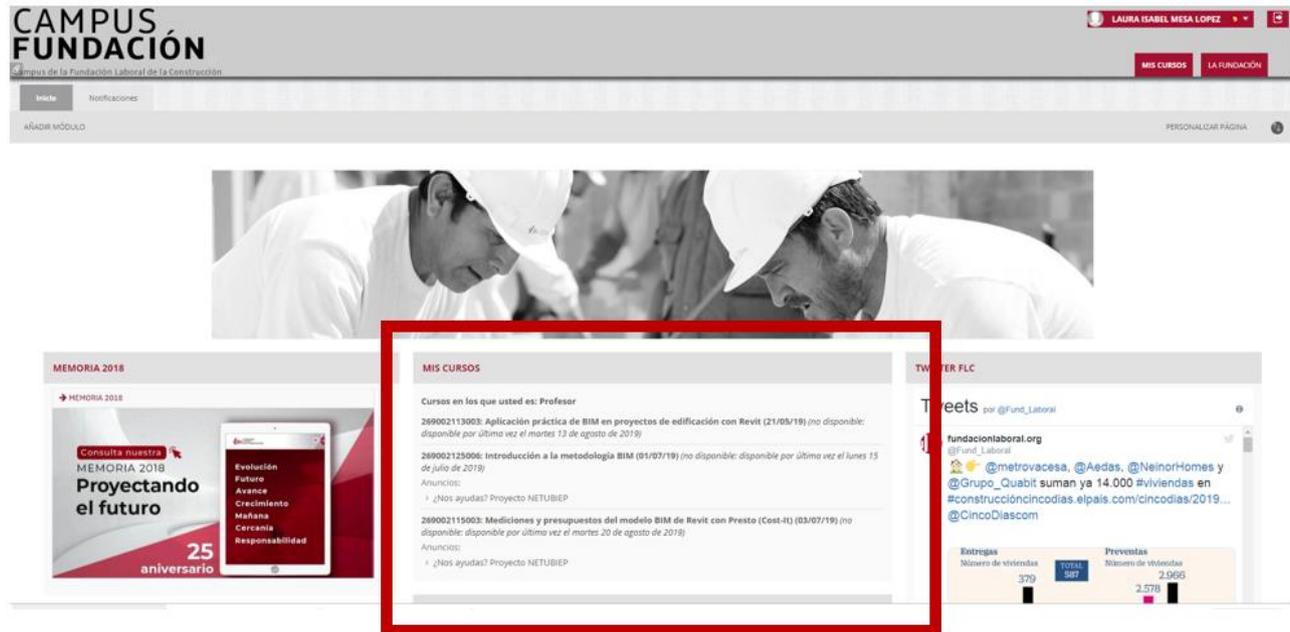
On the same website where you can subscribe for the courses, there is also a blog where the NET-UBIEP project has been promoted which can be found [here](#).



The link to the portal is available here:

[https://www.campusfundacion.org/webapps/portal/execute/tabs/tabAction?tab\\_group\\_id= 41 1](https://www.campusfundacion.org/webapps/portal/execute/tabs/tabAction?tab_group_id= 41 1)

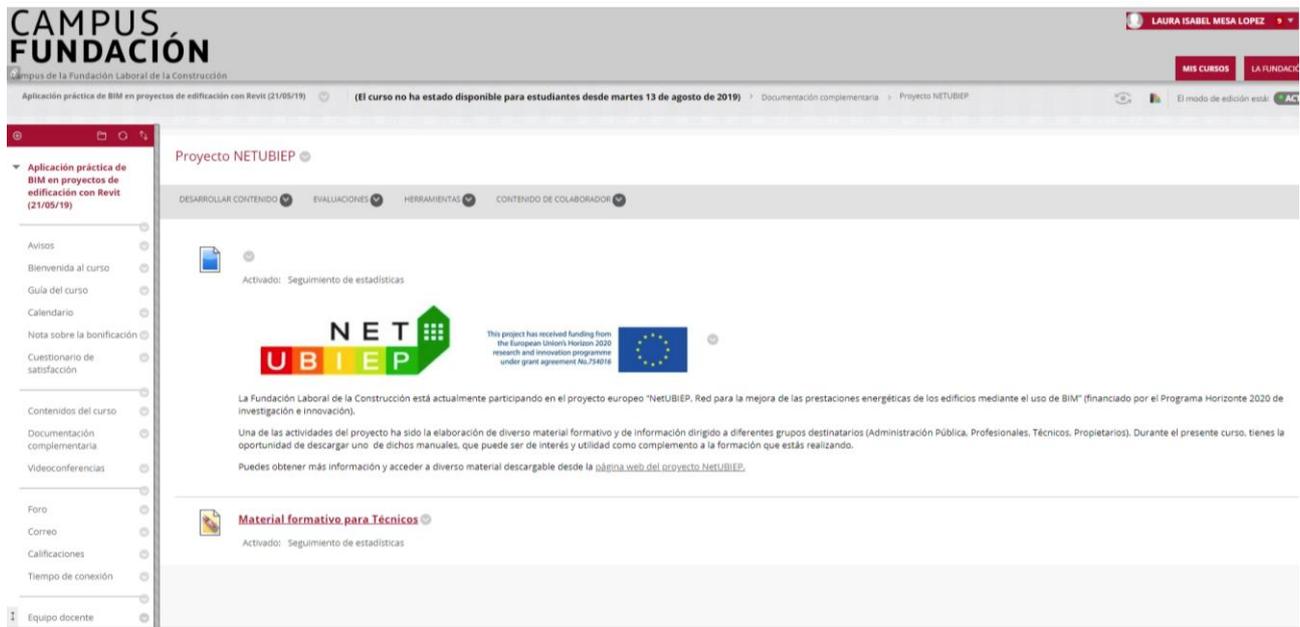
Once you log in the portal, this will appear on your screen with a couple of the BIM courses where project materials are included (inside the red square) that are still active or just finished. Please, bear in mind, that in summer courses are not running.



If you click on the course this will appear and to see project click on “documentación complementaria” on the left.



And here the Net-UBIEP courses can be found.



The Spanish partners declare that the e-learning courses where the NET-UBIEP materials are included are focused on BIM. In the D4.4 report, Spanish partners provided just one example of one course where these materials are available. However, they can also be found in other courses dealing with Energy efficiency in buildings.

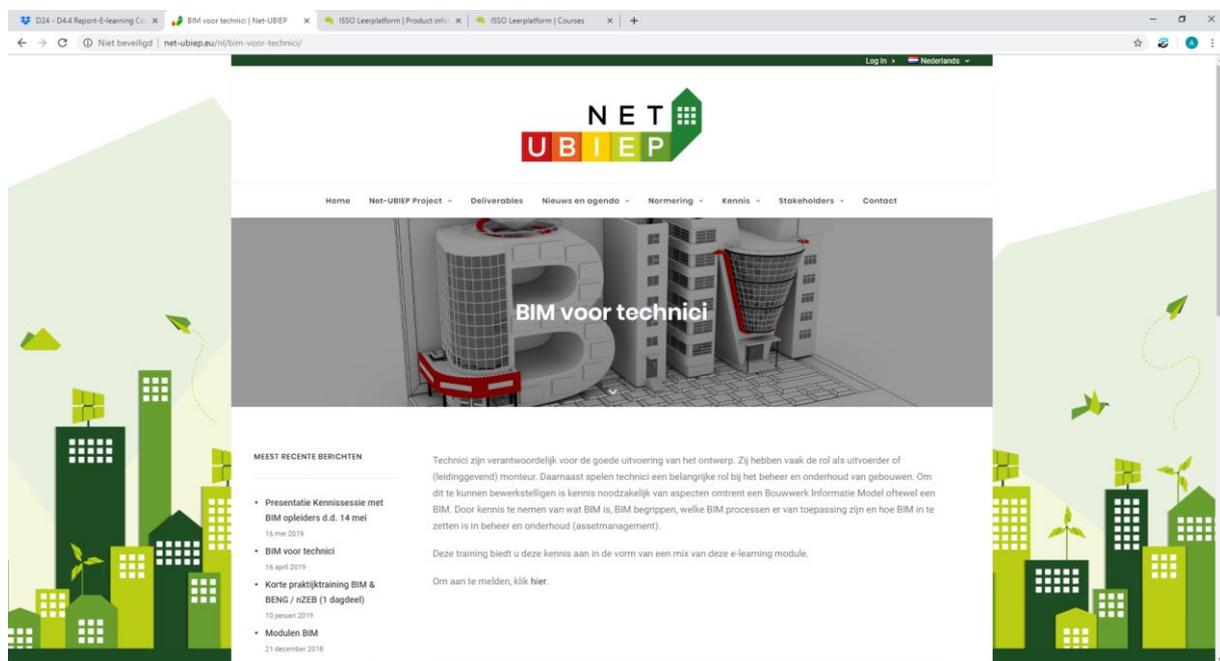


## 2.7 The Netherlands

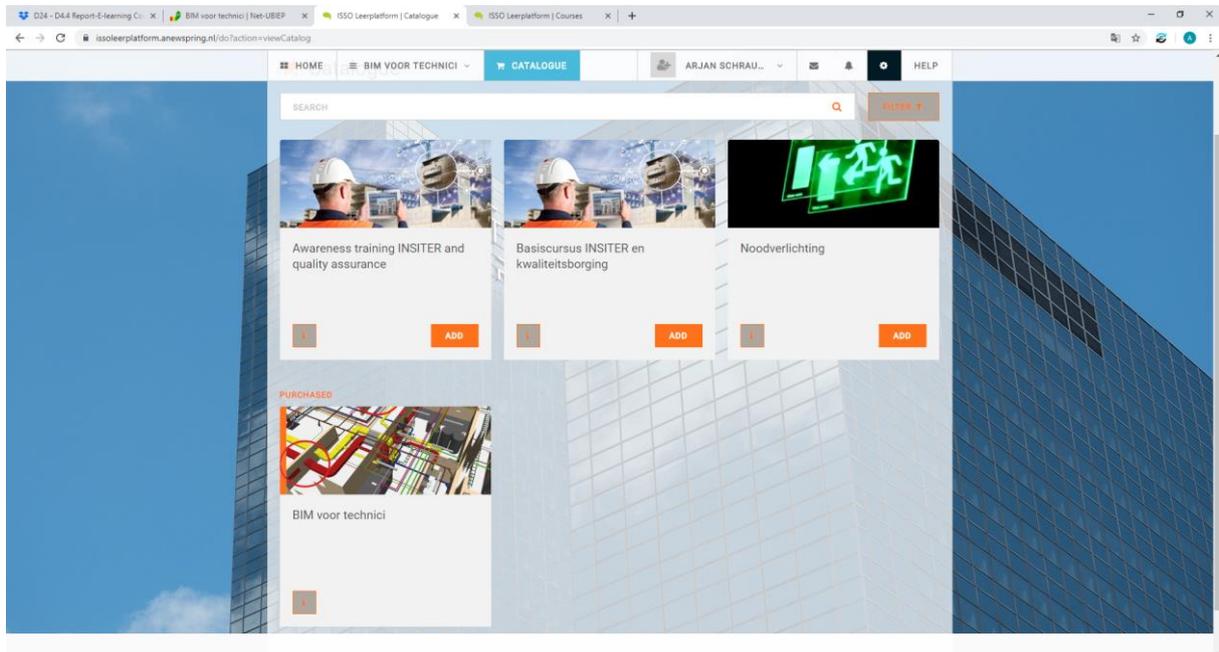
### 2.7.1 E-course description

Technicians are responsible for the proper execution of the design. They often play the role of executor or (managerial) engineer. In addition, technicians play an important role in the management and maintenance of buildings. To achieve this, knowledge of aspects concerning a Building Information Model or a BIM is required. By taking note of what BIM is, BIM concepts, which BIM processes are applicable and how BIM can be used in management and maintenance (asset management). This training offers the participant this knowledge in the form of this e-learning module.

The developed E-learningcourse is freely available for people who are interested. Potential participants can apply on the Net-UBIEP website: <http://www.net-ubiep.eu/nl/bim-voor-technici/>



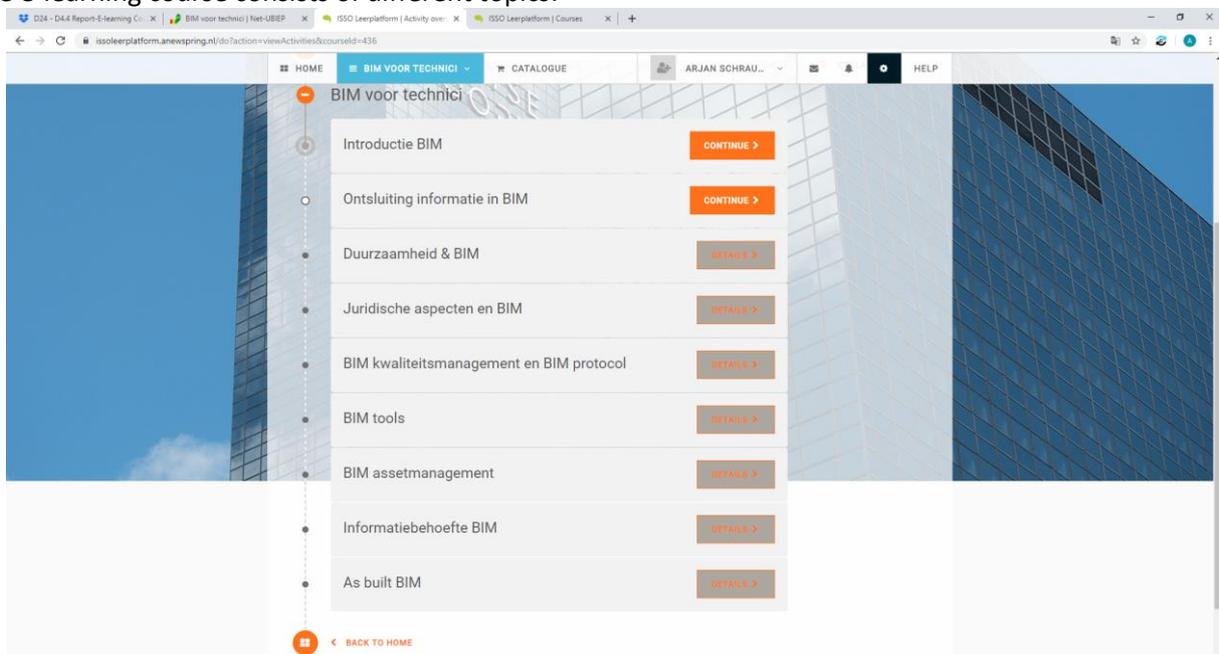
and the course can be found at: <https://issoleerplatform.anewspring.nl/do?action=viewCatalog>



More specific: <https://issoleerplatform.anewspring.nl/do?action=viewProduct&id=151>

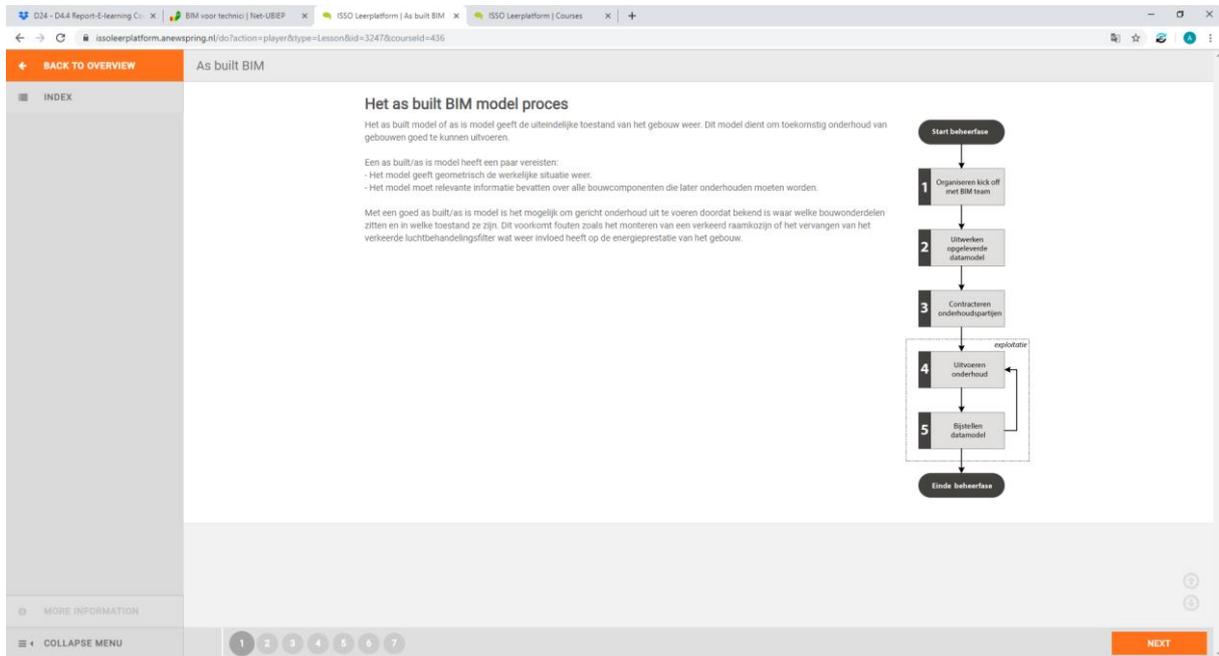
### 2.6.2 Functionalities and features of the e-learning platform

The e-learning course consists of different topics:



Each of these topics starts with a description of the subject. After this the subject is discussed more indepth.

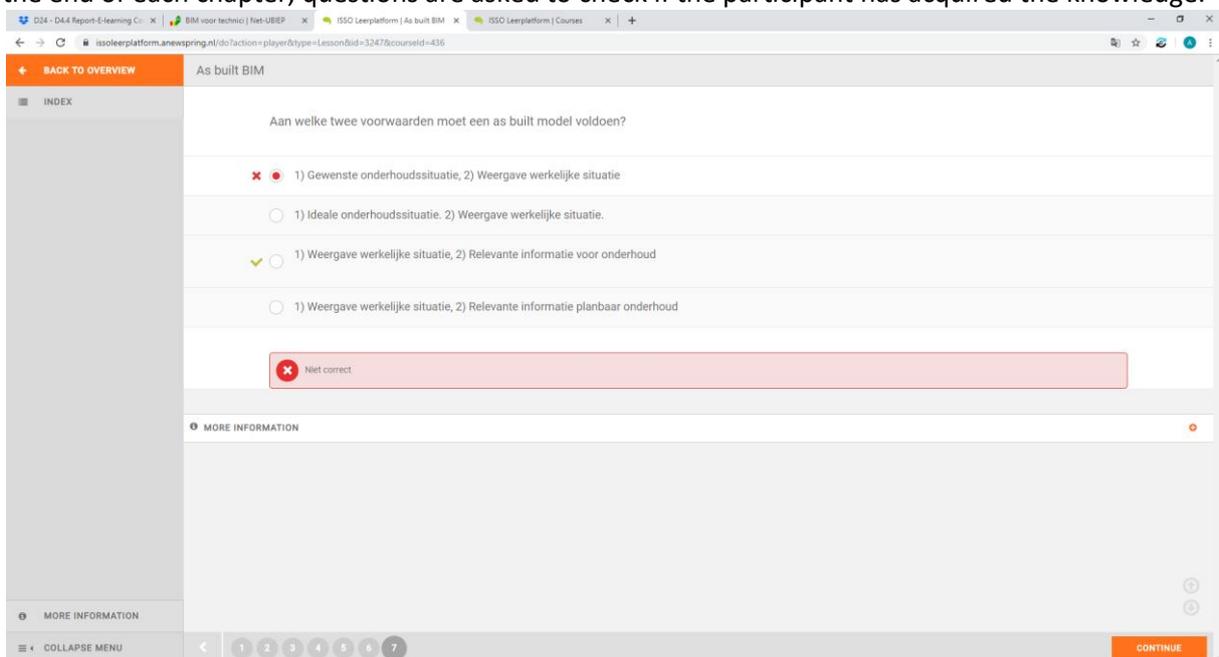




45

Where needed the e-learning module is enriched with illustration and scheme's. We are working to add video material to the e-learning material where a fellow worker in the field explains the different parts of the specific subject. However this functionality will be added at the end of 2019 and is therefore not available at this moment.

At the end of each chapter, questions are asked to check if the participant has acquired the knowledge.



The next step is to develop exams to certify the technician.



This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 754016.

This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.

The present deliverable will be update during the project in order to align the outcome to the market needs as well as to other BIM related projects realized within Horizon 2020 program.

The updated version of the deliverable will be only available in the website of the project [www.net-ubiep.eu](http://www.net-ubiep.eu).

Some deliverables could also be translated in partners national languages and could be find in the respective national web pages. Click on the flags to open the correspondence pages:



International web page



Italian web page



Croatian web page



Slovak web page



Spanish web page



Dutch web page



Estonian web page



Lithuanian web page

