



**SMA  
CITE**

Enhancing skills  
for smart city tech

**SMACITE**

Boosting the technical  
and non-technical skills  
and competences  
of smart cities technicians  
and engineers

**WP5: Pilots and testing**

**D5.2: Trainer Handbook**

Version 1.0



Co-funded by the  
European Union

## DELIVERABLE FACTSHEET

<b>Project Number:</b>	101052513
<b>Project Acronym:</b>	SMACITE
<b>Project Title:</b>	Boosting the technical and non-technical skills and competences of smart cities technicians and engineers
<b>Work Package:</b>	WP5: Pilots and testing
<b>Task:</b>	T5.2 Selection and preparation of trainers and trainees
<b>Deliverable:</b>	D5.2: Trainer handbook
<b>Version:</b>	1.0
<b>Editor(s):</b>	Stefano Antona (APRO), Annalisa Rizzo (APRO)

## DELIVERABLE HISTORY

Version	Name	Partner	Date	Comments
0.1	Stefano Antona Annalisa Rizzo	APRO	15/11/2023	1 <sup>st</sup> edition of deliverable for review
0.2	Vasileios Gkamas	UPATRAS	21/11/2023	Review of deliverable
0.3	Stefano Antona Annalisa Rizzo	APRO	28/11/2023	Integration of changes based on the review
1.0	Maria Rigou	UPATRAS	28/11/2023	Final edition

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## PROJECT SUMMARY

The project aims to address the skills gap of Smart Cities technicians and engineers, by designing and testing a vocational education and training program that is based on a novel and multi-disciplinary curriculum combining digital skills on Smart Cities enabling technologies, with soft, entrepreneurship and green skills.

The expected project outputs are:

- A Smart Cities competences map and ESCO-compliant Smart Cities job profiles.
- A Smart Cities curriculum combining both technical and non-technical skills and competences and promoting personalized learning pathways.
- Learning resources for Smart Cities enabling technologies and for building the soft, entrepreneurship and green skills of Smart Cities technicians and Engineers.
- A diagnostic tool to identify personalized learning pathways.
- A MOOC for Smart Cities enabling technologies.
- Virtual Worlds for building the soft, green and entrepreneurship skills of Smart Cities technicians and engineers.

The main project beneficiaries are Smart Cities technicians and engineers either from the public sector (i.e. municipalities) or enterprises providing Smart Cities solutions, as well as HEI and VET students interested in Smart Cities.

The curriculum will be tested through 4 national pilots in Greece, Bulgaria, Spain and Italy with at least 160 trainees. The certification of the skills and competences will follow a two-fold approach: (a) using micro-credentials to recognize the knowledge and skills gained through the successful completion of each online training module at the MOOC and Virtual Worlds and (b) designing the “Smart Cities Specialization Certification” that will be awarded to those passing online certifications exams with e-proctoring after the completion of the training modules.

The project will create an ecosystem for the co-design and co-development of an innovative curriculum and technology-enhanced learning tools for the upskilling/reskilling of Smart Cities technicians and engineers.

# 1 Introduction

This deliverable consists of the SMACITE Trainer Handbook. The aim of this document is to provide the basic guidelines for trainers participating in the national pilots of the SMACITE curriculum. This includes an overview of the entire curriculum and the main features of the MOOC, and the Virtual Worlds and the tools provided for support and feedback during the pilots.

Note that this teachers guide is based on the first version of the SMACITE curriculum. The final version of the curriculum will be derived by integrating the feedback collected during the pilots.

## 1.1 Structure of the deliverable

The structure of the deliverable is the following:

- Section 1 is the introduction of the deliverable that describes each scope and structure, the target audience and the dependencies with other WPs and deliverables of the SMACITE project.
- Section 2 describes the courses available on the SMACITE MOOC platform, how to get started with the MOOC, as well as how to use the MOOC as a trainer.
- Section 3 provides guidelines about the use of the Virtual Worlds platform as a trainer.
- Section 4 briefly describes the certification opportunities offered by the SMACITE project.

## 1.2 Target audience

The target audience of this deliverable are:

- Trainers: Education and training providers both at vocational level, i.e. VET providers and higher level, i.e. HEIs which will test the SMACITE curriculum.
- Research institutions that are working in the domain of education and training.
- Policy makers in the domain of education and training.

## 1.3 Dependencies with other WPs and deliverables

This deliverable has dependencies with the following deliverables:

- “D2.2 The SMACITE curriculum for Smart Cities” of WP2: this deliverable defines the curriculum framework, the structure and content of each training module.
- “D2.3 Methodology for learners' training and assessment” of WP2: this deliverable will provide VET and HEI staff and organizations delivering the SMACITE the pedagogical framework and the tools that will be utilized to deliver training.
- “D2.4 Methodology for the certification of competences of Smart Cities technicians and engineers” of WP2: this deliverable will present the

methodology for the certification of the competences of Smart Cities technicians and engineers.

- “D4.1 Diagnostic tool to identify the training needs of Smart Cities technicians and engineers” of WP4.
- “D4.2 MOOC for Smart Cities” of WP4.
- “D4.3 Virtual Worlds for training on soft, entrepreneurship and green skills” of WP4.
- “D5.1: Pilot Plan” of WP5: this deliverable provides information about the pilot organization and rules.

## 2 The SMACITE MOOC platform

The SMACITE MOOC platform provides access to the courses included in the SMACITE curriculum, that combines an adaptive blend of technical courses for Smart Cities enabling technologies (e.g. cloud computing and IoT) and non-technical courses for building the soft, entrepreneurship and green skills and competences of Smart Cities Technicians and Engineers.

Each course is further divided into training modules allowing students to build their own personalized learning pathways based on their needs and the outcomes of the diagnostic tool (Task 4.1), thus promoting student-centered learning.

The curriculum includes 13 courses. 10 of them deal with technical knowledge and skills, while the rest 3 with non-technical knowledge and skills. The total duration of the curriculum is estimated to be 459 hours including self-study.

	Course	Estimated effort in hours
Technical courses	Smart Cities	40
	Internet of Things	40
	Cybersecurity	50
	Cloud Computing	40
	Data Analytics and Visualizations	40
	Machine Learning with Big Data	40
	3D Printing	28
	Blockchain	28
	Drones	24
	Autonomous Vehicles	24
	Soft skills	40



Non-technical courses	Entrepreneurship skills	40
	Green skills	25
Total duration		459

For each course the following elements are provided in this document:

- The course category, name, code and duration.
- The course description
- The teaching and learning methods for the course.
- The course objectives
- List of main topics of the module

The complete description of each course is available in the deliverable “D2.2 The SMACITE curriculum for Smart Cities”.

## 2.1 Presentation of MOOC courses

### 2.1.1 Smart Cities

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Smart Cities
<b>COURSE CODE</b>	SC
<b>DURATION</b>	40 hours during 7 weeks

#### COURSE DESCRIPTION

This course presents the general architecture of Smart City-type solutions, with special attention to agents (stakeholders), integration of different data sources, and the management, analysis and visualization of information. The student will learn about vertical use cases in various sectors, and will become familiar with the essential technological tools that allow these isolated solutions to work in complex Smart City applications that improve citizen’s quality of life making an efficient use of non-renewable natural resources, therefore optimizing available resources.

#### TEACHING & LEARNING METHODS

**Total Hours: 40**

The course is delivered through online asynchronous courses (38 hours) and an online synchronous revision session (2 hours) at the end of the course.

## OBJECTIVES

This unit aims to:

O1	Highlight the technological, ethical and environmental challenges that may arise in the deployment of Smart City solutions.
O2	Present Smart City real use cases and identify how different technologies are applied identifying its capabilities and limitations.
O3	Explain the layered architecture of Smart City-type solutions, from data generation, to decision-making processes and information's release.
O4	Familiarize the student with the requirements managed by Smart City solutions deployment, and main steps to follow

## MAIN TOPICS AND STRUCTURE

1. Introduction to the concept of Smart City
2. Cases of success
3. Technological solutions for Smart Cities
- 4.. Planning and deployment of Smart Cities solutions
5. Revision

### 2.1.2 Internet of Things

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Internet of Things
<b>COURSE CODE</b>	IoT
<b>DURATION</b>	40 hours during 7 weeks

## COURSE DESCRIPTION

This course deals with the Internet of Things (IoT) technology. Emphasis is placed on a) the key concepts of the IoT technology and its applications in the Smart Cities domain, b) the architecture and different components of IoT devices, c) the communication technologies employed by the IoT and d) the integration between IoT and cloud computing.

TEACHING & LEARNING METHODS	Total Hours: 40
The course is delivered through online asynchronous courses (42 hours) and a revision online synchronous session (2 hours) at the end of the course.	

OBJECTIVES	
This unit aims to:	
O1	Make the students familiar with the fundamentals of IoT technology, including the different hardware and software components, the IoT architecture and the data flow and messaging protocols
O2	Discuss IoT applications in Smart Cities
O3	Describe the architecture, different components and vulnerabilities of IoT devices
O4	Present the different communication protocols available for IoT
O5	Explain the interconnection between the IoT and the cloud

MAIN TOPICS AND STRUCTURE
1. Introduction to IoT
2. IoT Devices
3. IoT Communications
4. IoT Cloud
5. Revision

### 2.1.3 Cybersecurity

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Cybersecurity
<b>COURSE CODE</b>	CYB
<b>DURATION</b>	50 hours during 6 weeks
COURSE DESCRIPTION	
This course provides an overview of the cybersecurity concepts, technologies, capabilities and use cases especially in Smart Cities. This will help students gain the necessary knowledge to design and implement cyber secure smart systems regarding	

data integrity, confidentiality and availability. Emphasis will be placed on a) cybersecurity threats identification, b) implementation of cybersecurity measures c) cybersecurity tools and techniques d) monitoring of IoT networks.

TEACHING & LEARNING METHODS	Total Hours: 50
The course is delivered through online asynchronous courses (48 hours) and a revision online synchronous session (2 hours) at the end of the course.	

OBJECTIVES	
This unit aims to:	
O1	Make the students familiar with the fundamentals of cybersecurity
O2	Present the cybersecurity implications in Smart Cities
O3	Define a cyber secure architecture for Smart Cities
O4	Present the most important cyber threats
O5	Explain the most important cybersecurity measures and techniques are
O6	Present what is a risk management plan

MAIN TOPICS AND STRUCTURE
1. Introduction to Cybersecurity in Smart Cities
2. Cyber threats and attacks
3. Cybersecurity policies and measures
4. Cybersecurity tools and techniques
5. Monitoring a Smart City
6. Risk management
7. Course revision

### 2.1.4 Cloud computing

COURSE CATEGORY	Enabling Technologies
COURSE NAME	Cloud Computing
COURSE CODE	CC
DURATION	40 hours during 7 weeks

## COURSE DESCRIPTION

This course presents the characteristics of different Cloud Computing solutions, highlighting their advantages and disadvantages for each use case. The student will gain experience in the deployment and use of cloud infrastructures, platforms and applications, both private and public. An introduction to native application development paradigms for Cloud Computing is also made, with special attention to integration and continuous deployment.

## TEACHING & LEARNING METHODS

**Total Hours: 40**

The course is delivered through online asynchronous courses (38 hours) and an online synchronous revision session (2 hours) at the end of the course.

## OBJECTIVES

This unit aims to:

O1	Explain the technological advances that have stimulated the centralization of computing capacity in cloud services, and the needs that are causing part of this capacity to return to the edge.
O2	Describe the characteristics, advantages and disadvantages, of different Cloud Computing solutions.
O3	Familiarise students with the deployment of cloud infrastructures, platforms and applications.
O4	Outline the capabilities of commercial cloud computing services.
O5	Present the most common programming paradigms for the development of native Cloud Computing applications, together with efficient and secure deployment strategies.
O6	Highlight Cloud Computing and new technologies synergies.

## MAIN TOPICS AND STRUCTURE

1. Introduction to Cloud Computing
2. Cloud Computing Infrastructure
- 3.. Deployment of Cloud Computing solutions
4. Hyperscalers: Amazon Web Services, Microsoft Azure and Google Cloud Platform
5. Introduction to software development and deployment for Cloud Computing
6. New technologies applied to Cloud Computing

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## 7. Revision

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### 2.1.5 Data analytics and Visualizations

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Data Analytics and Visualizations
<b>COURSE CODE</b>	DAV
<b>DURATION</b>	40 hours during 7 weeks

COURSE DESCRIPTION
<p>This course provides an overview of Data Analytics and Visualizations concepts, methodologies, techniques and use cases oriented in Smart Cities. The course will help students gain the necessary knowledge to integrate advanced data analytics techniques and well-established data visualization principles into SCs applications along with complementary technological paradigms such as Cloud Computing, Internet of Things (IoT) and Augmented/Mixed Reality.</p>

TEACHING & LEARNING METHODS	Total Hours: 40
<p>The course is delivered through online asynchronous courses (38 hours) and a revision online synchronous session (2 hours) at the end of the course.</p>	

OBJECTIVES	
<p>This course aims to:</p>	
O1	Make the students familiar with the fundamental principles and techniques of data analytics and data visualization in the Smart Cities perspective
O2	Discuss Data Analytics for interpreting massive amounts of data in Smart Cities applications
O3	Describe Data Visualization concepts in Smart Cities applications
O4	Present Data Analytics and Data Visualization Smart Cities use cases
O5	Explain how Data Analytics and Data Visualization can be integrated with state-of-the-art technological trends such as Cloud Computing and IoT

## MAIN TOPICS AND STRUCTURE

1. Introduction to Data Analytics and Data Visualization
2. Data Analytics for SC
3. Data Visualization for SC
4. SM Use Cases
5. Revision

### 2.1.6 Machine Learning with Big Data

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Machine Learning with Big Data
<b>COURSE CODE</b>	MLBD
<b>DURATION</b>	40 hours during 7 weeks

#### COURSE DESCRIPTION

This course provides an overview of Machine learning concepts and related scientific domains, methodologies, techniques and use cases concerning the Smart Cities (SCs) domain. The course will help students gain the necessary knowledge to apply ML techniques in SCs scenarios by hands-on practice using simplified examples in Python. Moreover, they will see certain integration settings that combine ML with big data infrastructures (cloud) and IoT data streams.

#### TEACHING & LEARNING METHODS

**Total Hours: 40**

The course is delivered through online asynchronous courses (38 hours) and a revision online synchronous session (2 hours) at the end of the course.

#### OBJECTIVES

This course aims to:

O1	Introduce students to the basic Machine Learning (ML) concepts, types of techniques, how ML relates to data mining, and provide examples of typical applications in the SCs domain
O2	Explain Machine Learning techniques suitable for the data gathered from typical SCs application domains and how they can support effective decision making

O3	Describe representative case studies of using Machine Learning and data mining from the SCs domain and give examples of implementation in relative programming environments
O4	Explain how Machine Learning can be integrated with state-of-the-art technological trends such as Cloud Computing and IoT

### MAIN TOPICS AND STRUCTURE

1. Introduction to Machine Learning with Big Data
2. ML for Smart Cities
3. ML case studies for Smart Cities
4. ML combined with IoT and Cloud Computing
5. Revision

### 2.1.7 3D printing

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	3D Printing
<b>COURSE CODE</b>	3DP
<b>DURATION</b>	28 hours during 7 weeks

### COURSE DESCRIPTION

The purpose of the course is to provide an overview of 3d modeling, design, and printing, as well as its uses in the context of smart cities. In smart cities, sound technological solutions are required to minimize resources, maximize ergonomic functions, reduce costs, and rethink strategies and processes; hence 3D printing is a perfect match.

### TEACHING & LEARNING METHODS

Total Hours: 28

The course is delivered through online asynchronous means.

### OBJECTIVES

This unit aims to:



O1	Make the attendants familiar with the concept of 3d modeling
O2	Make the attendants familiar with the concept of 3d design
O3	Make the attendants familiar with the concept of 3d printing
O4	Describe the use of the 3d modeling, design and printing technology in the context of smart cities

### MAIN TOPICS AND STRUCTURE

1. Introduction to 3-d Technologies
2. 3d Design
3. 3d printing
4. Applications of 3D printing in Smart cities

#### 2.1.8 Blockchain

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Blockchain
<b>COURSE CODE</b>	Blockchain
<b>DURATION</b>	28 hours during 7 weeks

### COURSE DESCRIPTION

This course provides an overview of the blockchain technology. Blockchain can play a key role in solving societal issues and achieving efficient urban management in modern cities. Blockchain enables network participants to exchange data with a high degree of reliability and transparency without the need for a centralized administrator. Cities have a variety of stakeholders and the exchange of data among stakeholders is essential for highly convenient urban services. Blockchain is expected to be used for this data exchange. Cities based on blockchain are considered to be more competitive, sustainable, and inclusive than their counterparties. Embracing the blockchain, cities under a new form of governance will better integrate citizen needs, boost the collaborative economy, and make both corruption and fraud, more difficult.

### TEACHING & LEARNING METHODS

**Total Hours: 28**

The course is delivered through online asynchronous means (28 hours).

OBJECTIVES	
This unit aims to:	
O1	Make the students familiar with the fundamentals of blockchain technology
O2	Discuss blockchain applications in smart Energy and smart Mobility
O3	Discuss blockchain applications in Public Administration and Services
O4	Describe the applications of blockchain in smart Real Estate
O5	Discuss the applications of blockchain and cybersecurity in smart cities

MAIN TOPICS AND STRUCTURE
1. Blockchain architecture
2. Types of Blockchain technology
3. Cryptography
4. Data structures
5. Smart contracts
6. Web development
7. Programming for blockchain
8. Blockchain applications for SCs

### 2.1.9 Drones

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Drones
<b>COURSE CODE</b>	Drones
<b>DURATION</b>	24 hours during 6 weeks

COURSE DESCRIPTION
The course presents autonomous vehicles, the main principles and underlying technologies for Aerial Unmanned Vehicles (UAVs, aka drones). Furthermore, applications of the subject technologies in smart cities are provided, along with specific case studies.

TEACHING & LEARNING METHODS	Total Hours: 24
The course is delivered through online asynchronous means.	

OBJECTIVES	
This unit aims to:	
O1	Present the main technologies related to unmanned aerial vehicles
O2	Present commonly used hardware used for unmanned vehicles
O3	Present autonomous vehicle modeling and control
O4	Analyze the safety frameworks and current industry practices for vehicle development
O5	Present applications of unmanned and autonomous vehicles related to smart cities

MAIN TOPICS AND STRUCTURE
1. Introduction
2. Historical review
3. Types of unmanned vehicles
4. Drone technology
5. Drone applications
6. Drone applications in Smart cities

### 2.1.10 Autonomous Cars

<b>COURSE CATEGORY</b>	Enabling Technologies
<b>COURSE NAME</b>	Autonomous Vehicles
<b>COURSE CODE</b>	Autonomous cars
<b>DURATION</b>	24 hours during 6 weeks

COURSE DESCRIPTION
The course presents autonomous cars, the main principles and the underlying technologies. Furthermore, applications of the technologies in smart cities are provided, along with specific case studies.

TEACHING & LEARNING METHODS	Total Hours: 24
The course is delivered online asynchronously.	

OBJECTIVES	
This unit aims to:	
O1	Present the main technologies related to autonomous cars
O2	Present commonly used software and hardware for autonomous cars
O3	Present autonomous cars modeling and control
O4	Analyze the safety frameworks and current industry practices for autonomous cars development
O5	Present applications of autonomous cars vehicles related to smart cities

MAIN TOPICS AND STRUCTURE
1. Introduction to autonomous cars
2. Historical review
3. Technology of Autonomous cars
4. Requirements
5. Open Challenges

### 2.1.11 Soft skills

<b>COURSE CATEGORY</b>	Horizontal Skills
<b>COURSE NAME</b>	Soft Skills
<b>COURSE CODE</b>	SS
<b>DURATION</b>	40 hours during 8 weeks

COURSE DESCRIPTION
The objective of this module is to define and explain the importance of soft skills for professionals and equip learners with skills that will enable them to navigate their environments, be flexible, communicate and work well with others, perform well and achieve their goals complementing hard skills and create additional value for their professional role.

TEACHING & LEARNING METHODS	Total Hours: 40
The course is delivered through online asynchronous courses (32 hours) and a revision online synchronous session (8 hours) at the end of the course.	

## OBJECTIVES

This unit aims to:

O1	Make the students familiar with the importance of cultivating their soft skills as key factors that contribute to their professional and personal development
O2	Present the Interpersonal communication skills and how to develop them
O3	Describe the importance of teamwork and collaboration for achieving better results / reaching the goals set within their work environment
O4	Describe the processes they need to undertake for developing their critical thinking and problem-solving skills
O5	Discuss about leadership and management and related topics (motivation, EQ) and their significance in their working life
O6	Discuss about changes, their effectiveness in people's behaviour and actions and the skills that need to be developed so as to overcome them successfully

## MAIN TOPICS AND STRUCTURE

1. Introduction to Soft Skills
2. Interpersonal Communication
3. Teamwork and Collaboration
4. Critical Thinking and Problem Solving
5. Leadership and Management
6. Managing Through Change
7. Revision

### 2.1.12 Entrepreneurship skills

<b>COURSE CATEGORY</b>	Horizontal Skills
<b>COURSE NAME</b>	Entrepreneurship skills
<b>COURSE CODE</b>	ES
<b>DURATION</b>	40 hours during 8 weeks

## COURSE DESCRIPTION

The objective of this module is to familiarize students with the conceptual framework, content, and operating environment of entrepreneurship as well as introduce them to the fundamentals of business development.

## TEACHING & LEARNING METHODS

Total Hours: 40

The course is delivered through 38 hours of asynchronous online instruction and a 2-hour synchronous online review session.

## OBJECTIVES

This unit aims to:

O1	Knowledge of the concept and significance of entrepreneurship, as well as the environment in which the business develops and operates
O2	A breakdown of the stages of the business process (developing a business idea; evaluating business models; developing a business plan; locating resources and forming agreements; selecting a sustainable development model)
O3	Recognition of the significance of the "eco-smart system" in the development of entrepreneurial action
O4	Management principles and techniques applicable to projects or one's own enterprise, with an emphasis on the discovery of novel approaches while adhering to established quality standards and legal requirements.

## MAIN TOPICS AND STRUCTURE

1. Introduction to Entrepreneurship
2. Entrepreneurship
3. Project management
4. Entrepreneurship and Innovation
5. Business Plan
6. Revision

### 2.1.13 Green skills

<b>COURSE CATEGORY</b>	Horizontal skills
<b>COURSE NAME</b>	Smart cities: sustainability and green skills

<b>COURSE CODE</b>	SGS
<b>DURATION</b>	25 hours during 7 weeks

### COURSE DESCRIPTION

This course provides a complete overview, with various levels of detail, of the basic concepts related to sustainability and the use of technology and the Internet of Things (IoT) inside Smart Cities. The educational path will help students to acquire the necessary knowledge to promote and develop one's own green skills, the application of technologies for the acquisition, processing and archiving of collected data. The goal is to create professionals capable of finding and developing increasingly innovative and sustainable solutions for the management of human activities typical of cities.

The course will focus on the concepts of circular economy, energy conservation and waste management.

### TEACHING & LEARNING METHODS

**Total Hours: 25**

The course is delivered through online asynchronous courses (19 hours) and three revision online synchronous sessions (6 hours) at the end of the course.

### OBJECTIVES

This unit aims to:

O1	Make the students familiar with the concepts related to sustainability and sustainable management of human activities typical of cities.
O2	Develop critical judgement skills on current ways of managing human activities in the city context
O3	Identify strengths and weaknesses in smart city management
O4	Develop alternative strategies to improve the sustainability of the systems analysed.
O5	Evaluate and predict performance improvement in planning new strategies
O6	Improve the sustainability of the society

### MAIN TOPICS AND STRUCTURE

1. Apply the circular economy concept

---

2. Energy conservation

---

3. Waste management

---

4. Revision

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## 2.2 Getting started with the MOOC platform

Here are provided some key topics related to the use of the SMACITE MOOC platform by teachers.

The Moodle SMACITE MOOC platform (<https://mooc.smacite.eu/> currently in BETA version) has incorporated a continuously evolving "Trainer Handbook" within the Moodle environment itself. It is available at <https://mooc.smacite.eu/course/view.php?id=25> (enrolment key: Tea4erSB0ok). This in-platform practical handbook serves as a living document, constantly updated and shaped by the real-time needs and feedback of trainers.

Throughout the pilot phase and beyond, trainers are encouraged to share their insights and submit their requests and suggestions for improvements or additional content that they believe would benefit their fellow trainers. Each training module will include a final questionnaire, part of the D6.3 Project evaluation plan, to collect feedback and assess student satisfaction.

### 2.2.1 User registration

In the SMACITE MOOC platform, accounts can be manually added by an administrator or users can create their accounts by themselves (e-mail based self-registration). When users want to register a new account, they need to hit the **Create new account button** on the Log-in page.

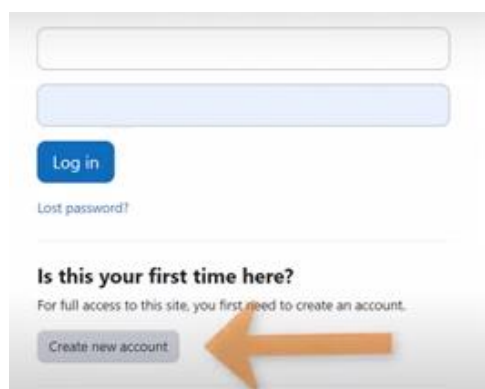


Figure 1: New account button

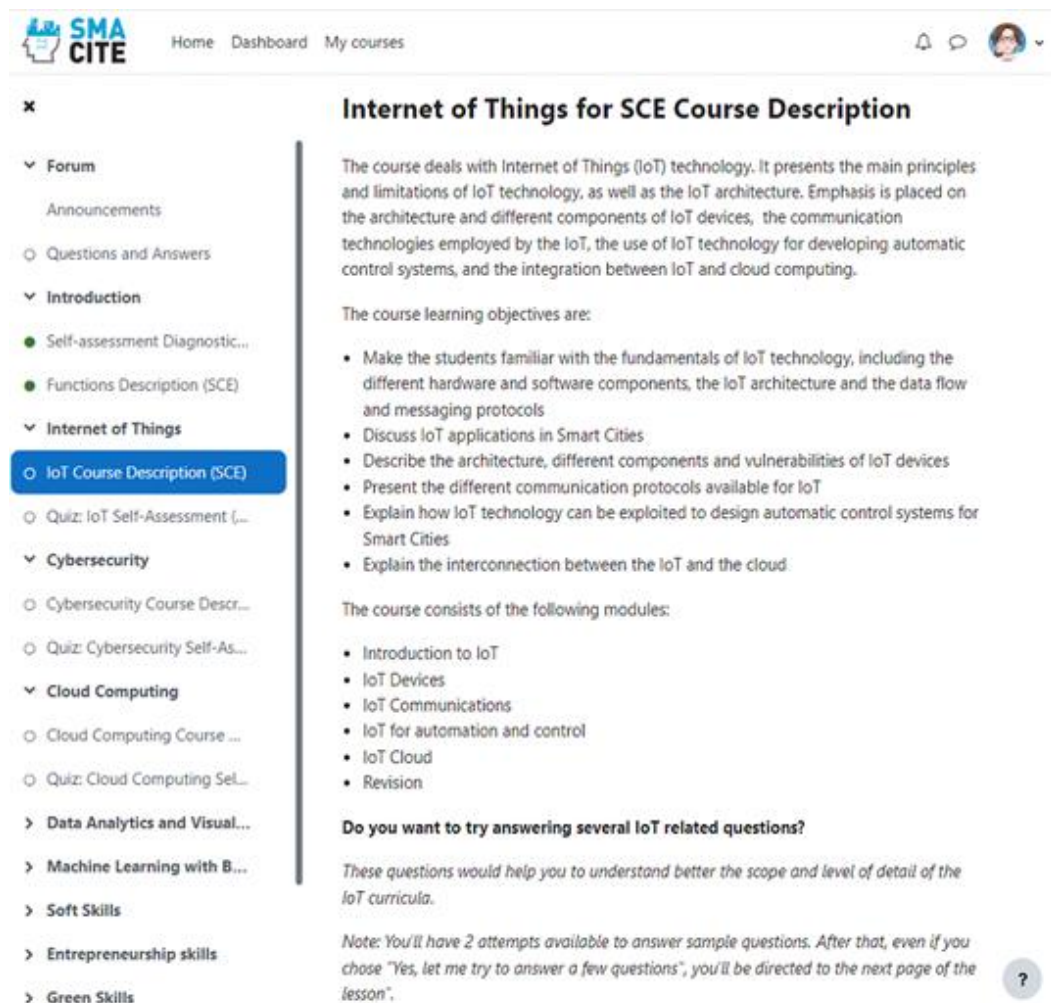
They will then receive an e-mail which they must click on to confirm they want to access the SMACITE Moodle site.



Note: If they don't receive the email (due to it ending up in the spam folder, being refused by the remote server, an invalid email address entered etc.), the administrator can manually confirm the account.

## 2.2.2 Diagnostic tool

Personalization is key to engaging learners in the training and learning process. This diagnostic tool was developed to help individual learners identify their training needs based on their previous knowledge, skills, and competences.



The screenshot shows a web interface for SMA CITE. The top navigation bar includes 'Home', 'Dashboard', and 'My courses'. The main content area is titled 'Internet of Things for SCE Course Description'. On the left, a sidebar menu lists various course topics, with 'IoT Course Description (SCE)' highlighted in blue. The main content area contains the following text:

The course deals with Internet of Things (IoT) technology. It presents the main principles and limitations of IoT technology, as well as the IoT architecture. Emphasis is placed on the architecture and different components of IoT devices, the communication technologies employed by the IoT, the use of IoT technology for developing automatic control systems, and the integration between IoT and cloud computing.

The course learning objectives are:

- Make the students familiar with the fundamentals of IoT technology, including the different hardware and software components, the IoT architecture and the data flow and messaging protocols
- Discuss IoT applications in Smart Cities
- Describe the architecture, different components and vulnerabilities of IoT devices
- Present the different communication protocols available for IoT
- Explain how IoT technology can be exploited to design automatic control systems for Smart Cities
- Explain the interconnection between the IoT and the cloud

The course consists of the following modules:

- Introduction to IoT
- IoT Devices
- IoT Communications
- IoT for automation and control
- IoT Cloud
- Revision

**Do you want to try answering several IoT related questions?**

*These questions would help you to understand better the scope and level of detail of the IoT curricula.*

*Note: You'll have 2 attempts available to answer sample questions. After that, even if you chose "Yes, let me try to answer a few questions", you'll be directed to the next page of the lesson".*

Figure 2: Internet of Things for Smart Cities Engineer Course Description

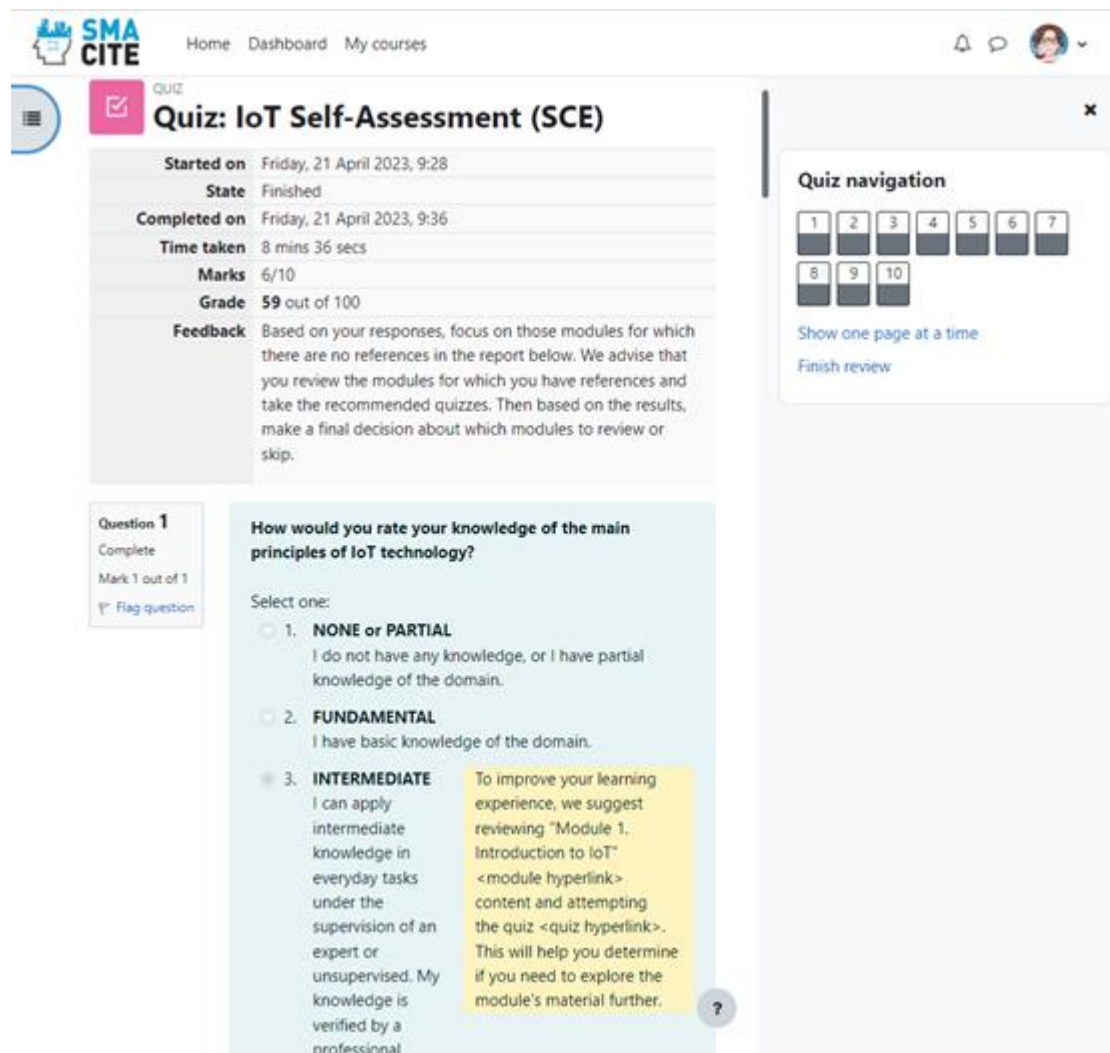
The diagnostic tool is structured around the knowledge and skills defined in the SMACITE "Smart Cities Engineer" (SCE) and "Smart Cities Technician" (SCT) job profiles and appears in two instances – one for SME (Smart Cities Engineers Diagnostic Tool to Identify Learner's Training Needs) and one for SMT (Smart Cities Technicians Diagnostic Tool to Identify Learner's Training Needs). Both instances have an identical structure.

The URLs to access the diagnostic tools are the following:

- [Diagnostic tool for Smart Cities Engineers](#)
- [Diagnostic tool for Smart Cities Technicians](#)

The diagnostic tool is organised by training topics, corresponding to the courses in the SMACITE curriculum. Each topic consists of two sections.

The first one, organised as a lesson named "course description", aims to help learners to understand the Smart Cities Engineer/Technician job profile. Learners will gain an insight into the specific knowledge and skills required to work in Smart Cities, through the lens of each different topic.



The screenshot displays the SMA CITE interface for a quiz report. At the top, the user is logged in and can navigate to Home, Dashboard, or My courses. The main heading is 'Quiz: IoT Self-Assessment (SCE)'. Below this, a table provides key statistics: Started on Friday, 21 April 2023, 9:28; State Finished; Completed on Friday, 21 April 2023, 9:36; Time taken 8 mins 36 secs; Marks 6/10; Grade 59 out of 100. A feedback section follows, advising the user to focus on modules with no references in the report. A 'Quiz navigation' panel on the right shows 10 question indicators, with the first question selected. Below the navigation, 'Question 1' is shown as complete with a mark of 1 out of 1. The question asks for a rating of IoT knowledge, with three options: NONE or PARTIAL, FUNDAMENTAL, and INTERMEDIATE. The 'INTERMEDIATE' option is selected, and a yellow callout box provides a recommendation to review 'Module 1: Introduction to IoT'.

Figure 3: Quiz report with detailed results and recommendations on course and modules levels

The second one will invite learners to take a quiz to assess their own knowledge and skills in that particular domain. The questions are designed to help learners identify their

strengths and weaknesses regarding the target competences for Smart Cities Engineers/Technicians.

Taking the quiz can be a valuable exercise in introspection and can help learners take a proactive approach to their own learning and development. It can also be a valuable resource for identifying career paths and job opportunities in Smart Cities. Last but not least, based on learners' knowledge and skills self-evaluation, the tool will provide recommendations on what modules from the course they might consider skipping or reviewing.

It's important to note that the diagnostic tool is designed for learners' information only. At the end of the day, learners are the ones to decide which modules and courses to take, regardless of the recommendation given by the tool.

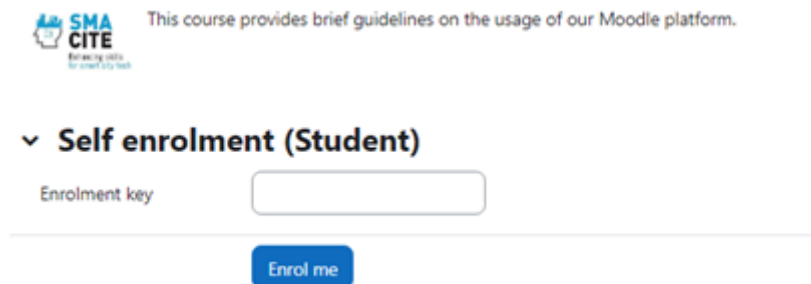
## 2.3 How to use the MOOC platform


### 2.3.1 Participation in a training course

For trainees to have access to a SMACITE course, they must first have an account in the SMACITE Moodle site.

Trainees can be manually enrolled in a course, or they can self-enrol themselves.

To prevent spammers from using forum posts and blog entries for spamming, we use unique enrolment keys for SMACITE courses in Moodle for self-enrolment. This means that a student must have the key in advance (it is to be provided by the teacher – for example via private email, snail mail, on the phone or even verbally in a face to face meeting).



 This course provides brief guidelines on the usage of our Moodle platform.

▼ **Self enrolment (Student)**

Enrolment key

**Enrol me**

Figure 4: Self enrolment section

Once students type the enrolment key, they get access to the course. They will only be asked for the key once, at the time of enrolment.

### 2.3.2 Use of announcements

An *Announcements* forum is a special forum for announcements and is automatically created when a course is created. A course can have only one announcement forum. Only teachers and administrators can post announcements.

To add an announcement, click the Add discussion topic button in Announcements.

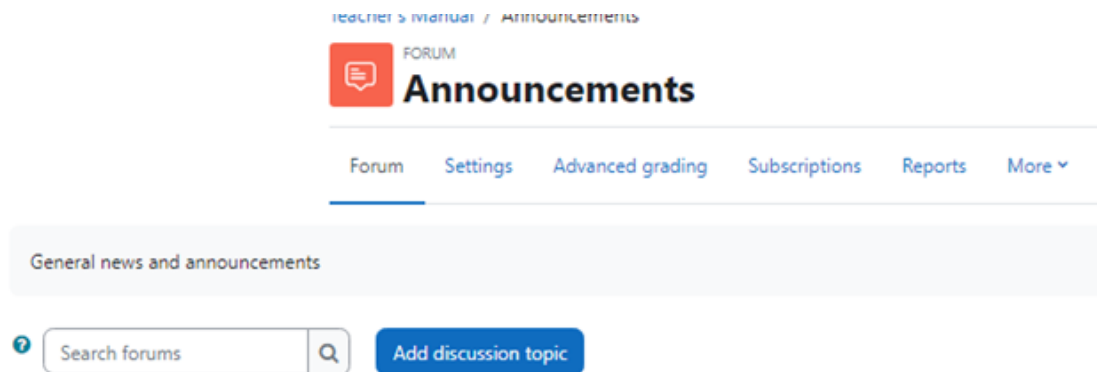


Figure 5: Add discussion topic button

The system will give you the opportunity to edit your message within the following 30 minutes.

### 2.3.3 Troubleshooting and information requests

A dedicated form is created as a “support line” for receiving and responding to course requests related to Moodle: <https://forms.gle/pM2bVNWAPWU2wfHr6> . Should you have any issues, comments, ideas, or suggestions, please send them through this form. Once your request is registered, you will receive confirmation and guidelines on maintaining your communication. The confirmation will be sent within 30 minutes to the email you submitted on the form.

## 3 How to use the Virtual Worlds

The SMACITE Virtual Worlds platform consists of two distinct systems: the front-end and the back-end system. The front-end system is a simulated virtual environment where trainers and trainees use avatars to engage with each other and participate in online training sessions (or meetings). On the other hand, the back-end system serves as the control center, allowing trainers to schedule meetings, set their duration, and upload materials that will be accessible during each meeting. This dual-system approach enhances the overall user experience by providing a seamless blend of immersive interaction and efficient backend management.

### 3.1 Front-end system

To access the front-end system, trainers and trainees should install the Windows executable that will be provided by Project Coordinator (i.e. University of Patras). Once you install the executable, the front-end starts with a login screen that is depicted in the following figure. The user (either the trainer or the trainee) should provide the username

and password of his/her account. The Project Coordinator will provide the accounts both for the trainees and trainers.

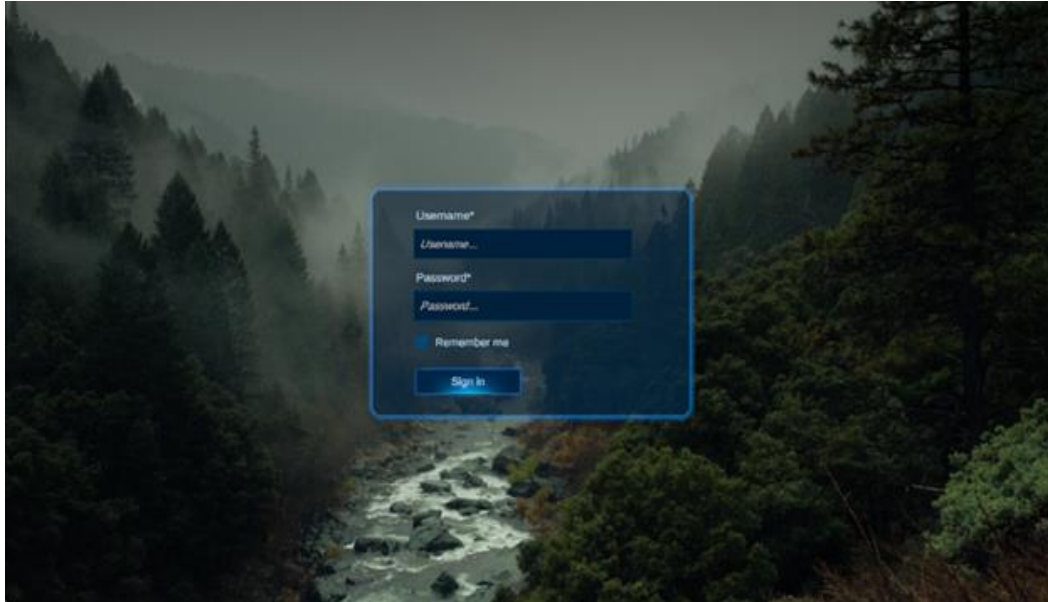


Figure 6: Login screen of the front-end system of Virtual Worlds

After logging in, users are greeted with the main screen of Virtual Worlds. Here, they can easily access a list of upcoming meetings organized by trainers (the trainees can see the meetings in which they have the privilege to participate). Additionally, the main screen offers customization options, allowing users to personalize their avatars and choose unique nicknames.

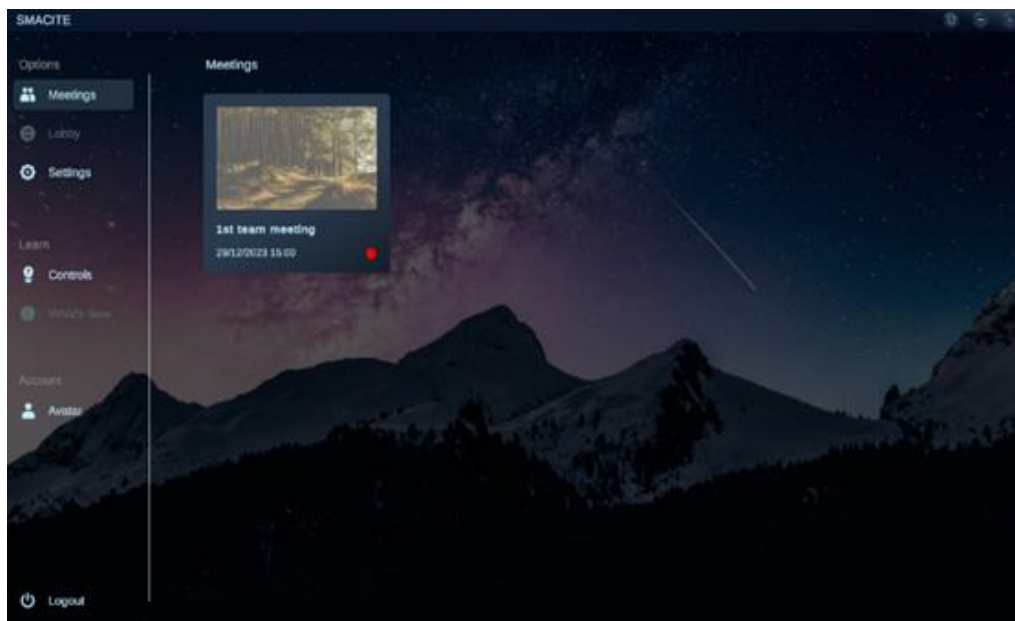


Figure 7: Home page of the application



A crucial aspect of the platform is the extensive avatar customization feature. Users can fine-tune various elements, including skin tone, hair style, facial hair, and outfit (both upper and lower body). The customization options even extend to accessories like hats. Users can choose between a male or female avatar, allowing for a broad spectrum of personalization. Once satisfied with their avatar's look, users can save it, and this becomes their visible identity during online training. This comprehensive customization not only enhances user engagement but also adds a personal touch to virtual interactions.

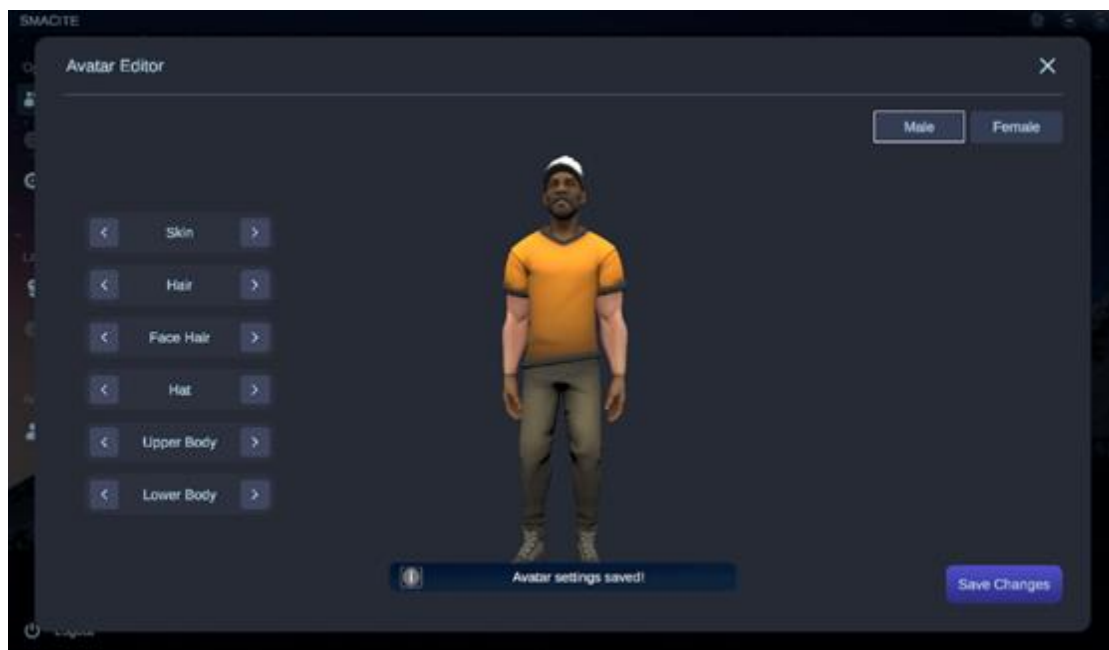


Figure 8: Avatar Customization (Male)



Figure 9: Avatar Customization (Female)

To join an online meeting, users just need to select the training icon and hit the join button. Each meeting panel provides essential information, such as its name, date, and scheduled time.

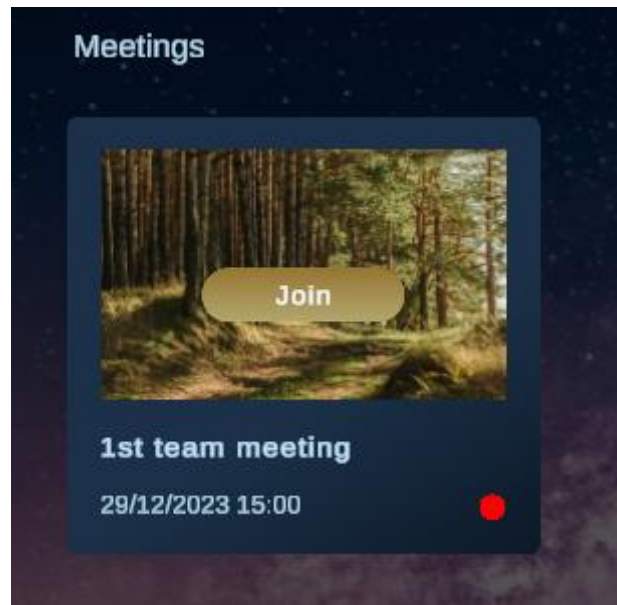


Figure 10: Meeting Tab

The meeting place isn't just a static environment; it's a dynamic virtual world tailored to the course content. Users can navigate this world using their avatars, allowing them to explore, interact, and engage with other participants.



Figure 11: Inside the Virtual Meetings



Figure 12: Different landscapes can be visited



Figure 13: Multiplayer capacity

A user-friendly menu positioned at the bottom right of the screen, offers quick access to various functions of Virtual Worlds. Additionally, trainers can load presentations, enhancing the platform's versatility.



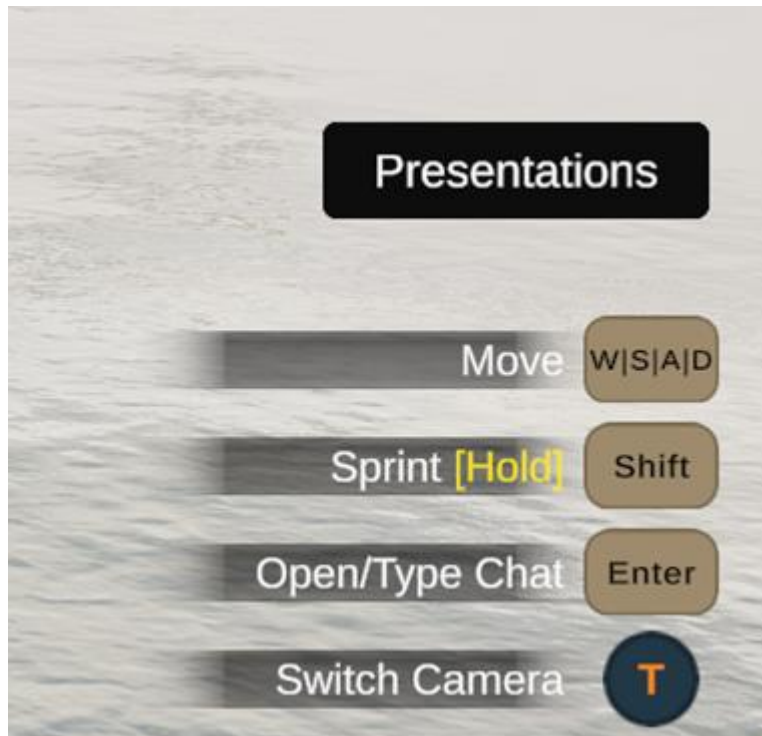


Figure 14: Users' menu

When users click on the "Presentations" option, a list of materials uploaded by the trainer pops up (trainees should first upload the materials in the back-end system – we will come back to this later). This allows the trainer to seamlessly bring these materials into the virtual world, integrating them into their teaching plan.

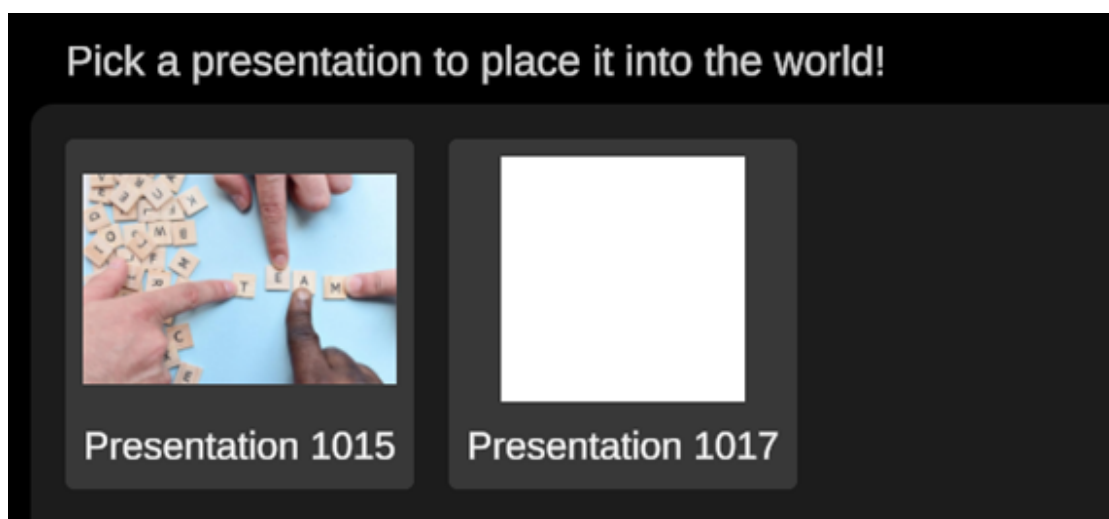


Figure 15: Available presentations uploaded by the trainer for the specific meeting.

The trainer can place the presentation wherever he/she prefers in the Virtual World. Then with the navigation buttons that are located in the bottom of the screen, he/she can select the different materials to load in the Virtual World.



Figure 16: Presenting in the Virtual World



Figure 17: Changing materials on the screen



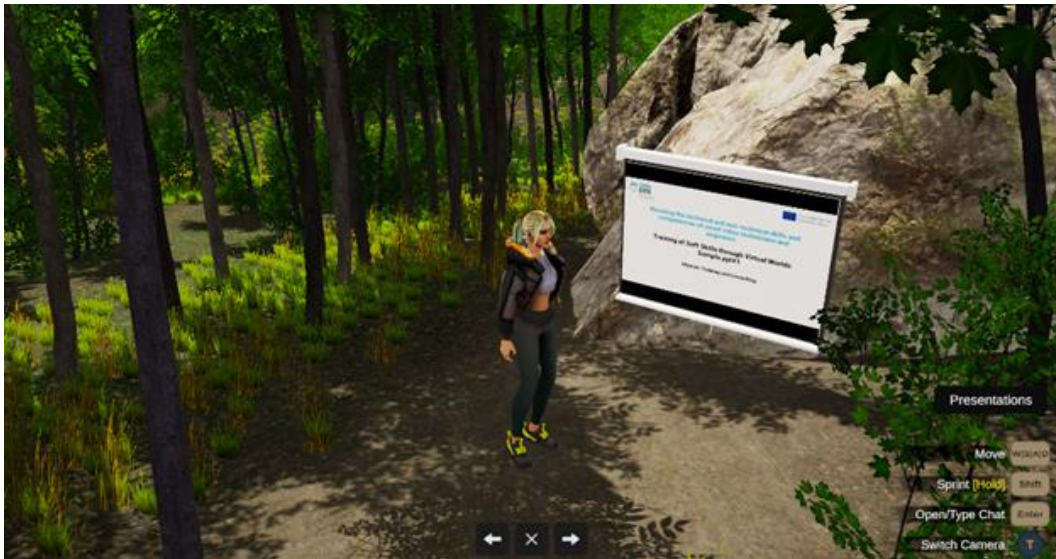


Figure 18: Placing presentations to different places, anywhere in the virtual World.

Users can open the chat panel located in the right bottom part of the Virtual World, by hitting the enter button, enabling seamless message exchanges with all participants in the Virtual World. Users in close proximity can also enjoy constant voice communication for a more immersive experience.

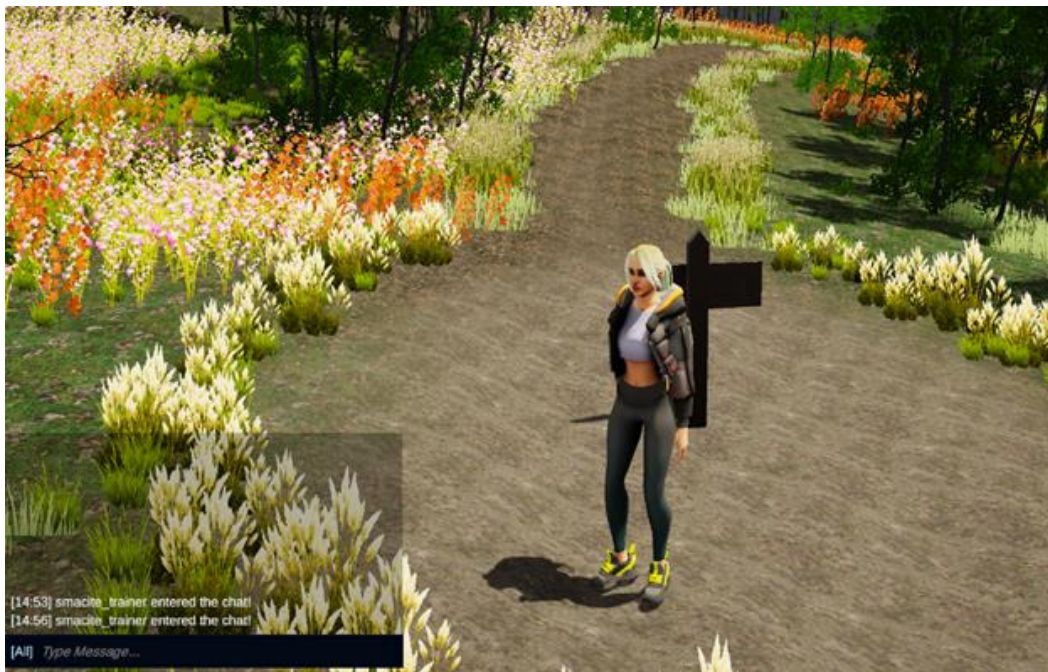


Figure 19: Chat system

### 3.2 Back-end system

The back-end system functions as a comprehensive web application, serving as a centralized management interface for Virtual Worlds. This includes user management,

meeting scheduling, uploading materials, and the assignment of trainees to specific meetings. The versatility of this system empowers trainers to efficiently organize and oversee various elements of the training program.

The back-end system is accessible through the following link: <http://vr-admin.smacite.eu>.

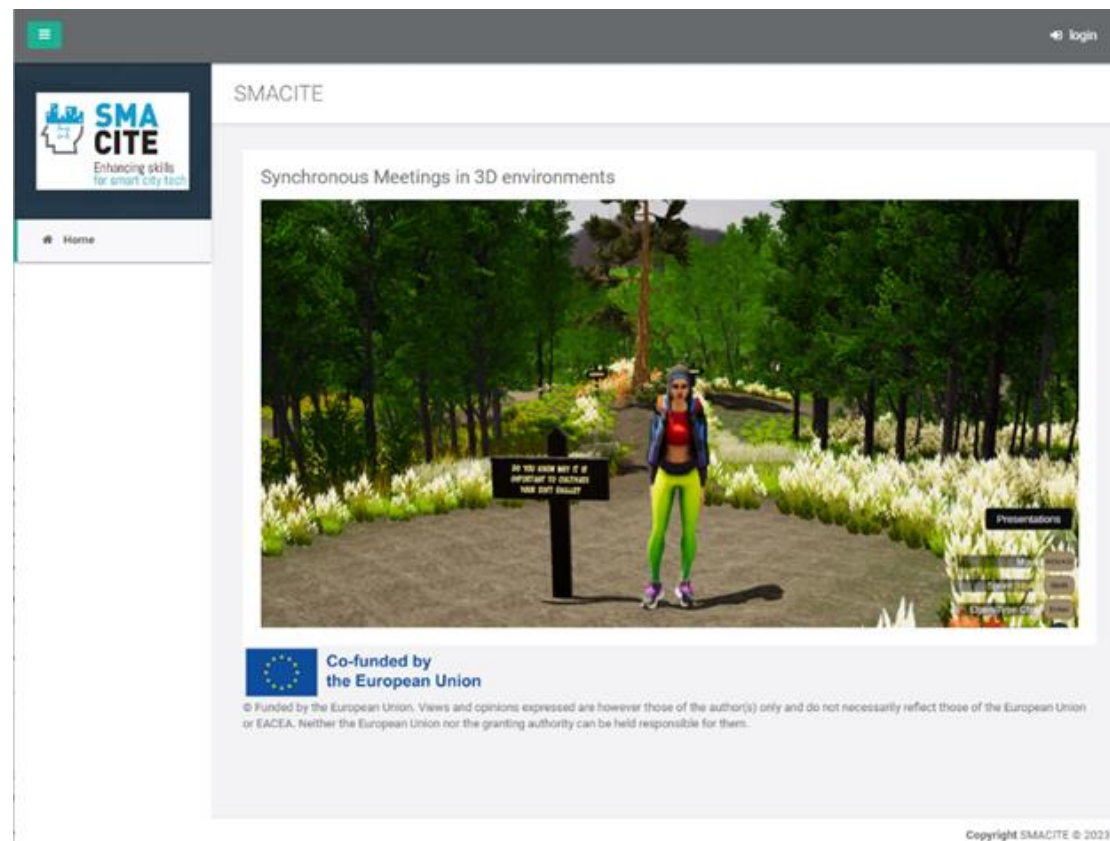


Figure 20: SMACITE back-end app

The back-end system supports 3 different roles:

- **Administrators:** They create accounts and assign roles to trainers and trainees.
- **Trainers:** They create training programs (i.e. for soft skills, green skills and entrepreneurship skills) and schedule meetings to these trainings.
- **Trainees:** They can (optional) access the back-end system, if they want to add their materials to a meeting (e.g. assignments given by the trainer).

At this handbook we discuss the trainers' area.

When trainers login, they can see the list of the existing training programs by selecting the "Trainings" option on the left menu.

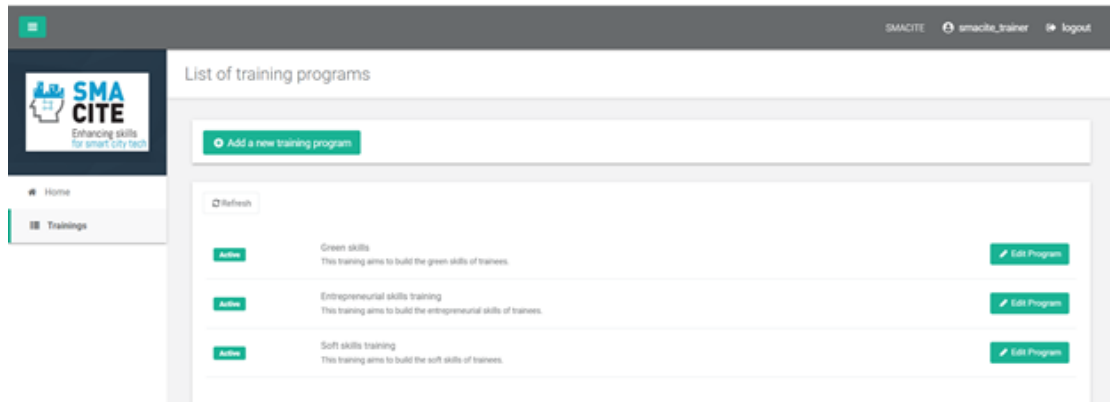


Figure 21: List of available training programs

Trainers can also add new training programs. To add a new training program, select the button “Add a new training program”, identify its title and description and press “Save”.

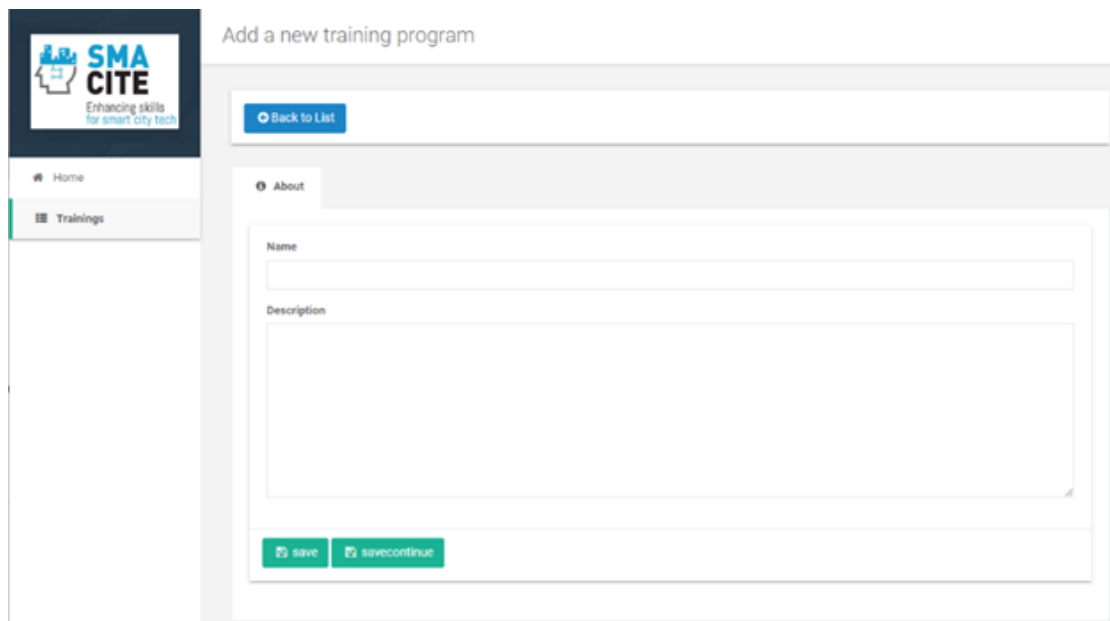


Figure 22: Adding a new training program

To edit a training program, press the “Edit Program” button. Then, you will see 3 tabs:

**1. About**

You can edit the name and description of the meeting.

**2. Meetings**

You can schedule a meeting that is associated with the selected training program. You have to provide the following information in order to schedule the meeting:

- Name: The name of the meeting.
- Description. A short description of the meeting.
- Place. Select the Virtual World in which the meeting will take place.
- Duration. The duration of the meeting in minutes.
- Date. The date of the meeting.
- Hours and minutes. The start hour of the meeting.

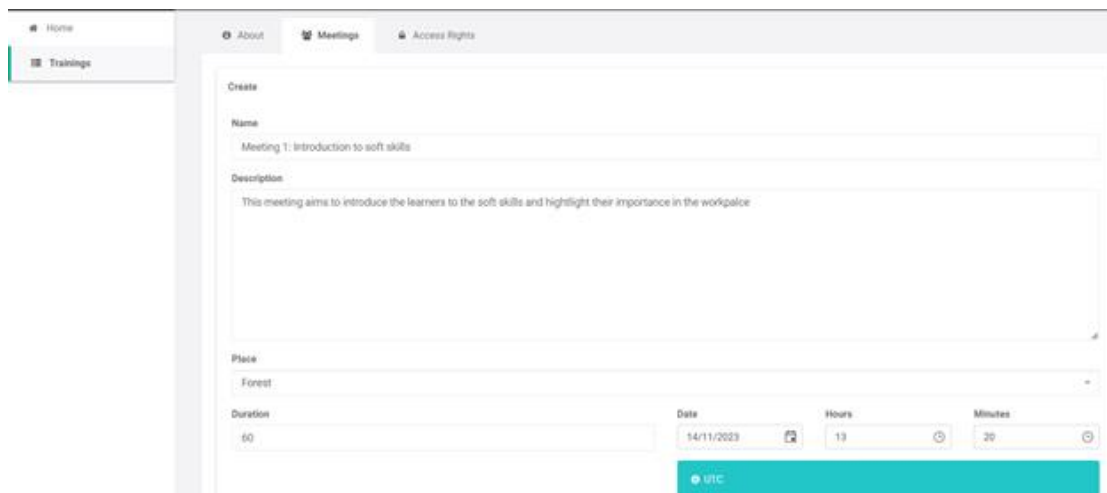


Figure 23: Configuring a new meeting associated with a training program.

Once you identify that information the schedule meeting is depicted under the training program.

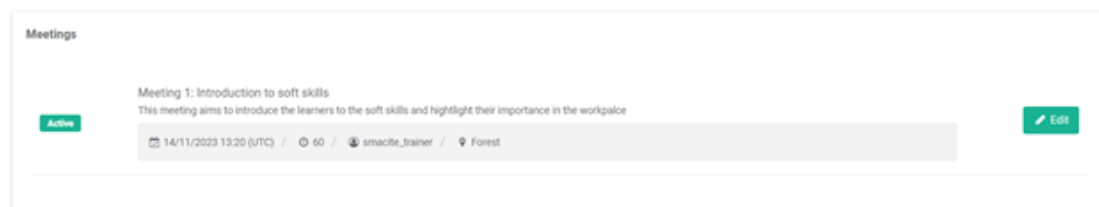


Figure 24: New meeting associated with a training program.

### 3. Access Rights

At the Access Rights tab, the trainer can see the trainees enrolled in the training program and select those that will participate in the specific meeting.

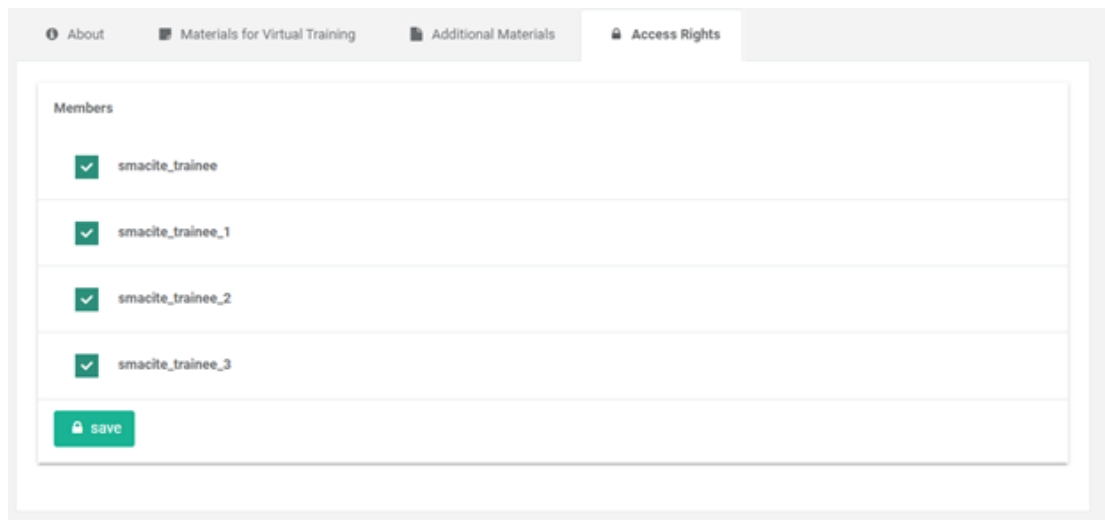


Figure 25: Selecting the participants of a meeting.

To edit a scheduled meeting follow the next steps.

- From the available training programs select the one with which the meeting is associated and press the “Edit Program” button.
- Select the “Meetings” tab. At the end of the page, you will see the schedule meetings.
- Press the “Edit” button.

Then you will see 4 tabs.

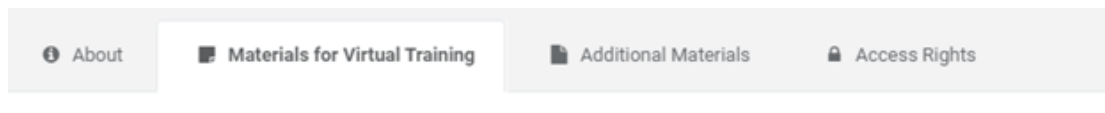


Figure 26: Available tabs while editing a schedule meeting

### 1. About

This is the information you have already provided when you scheduled the meeting.

### 2. Materials for Virtual Training

You can add materials for a meeting in the format of images or videos. Those training materials are organized in groups that the trainers create. This will help the trainer to open the training materials during the online training session (meeting). To add training materials, follow the next steps:

- Create a group by identifying its name and press “Save”.
- Press the “Edit” button of the previously created group.
- At the Multimedia (Image or Video) tab press “Select” to select the material and then “Upload” to upload the material.



The trainer can upload different materials in each group (images and video).

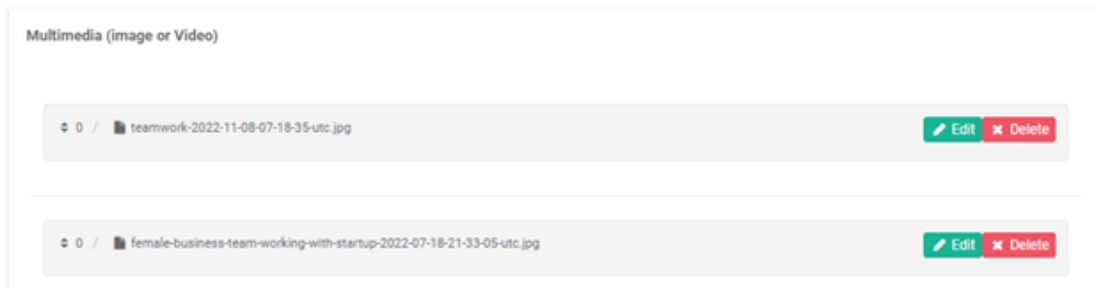


Figure 27: Multimedia materials for a meeting

The trainer can see these materials as a slide show.



Figure 28: Uploaded materials

### 3. Additional Materials

At this tab the trainer can add additional materials, such as an assignment for trainees.

### 4. Access Rights

Like while scheduling the meeting, at this tab the trainer can see the trainees enrolled in the training program and select those that will participate in the specific meeting.

## 4 Certification

Upon successfully completing each online course the student will get a Certification of Attendance. To successfully complete an online course, students should achieve at least 70/100 points as a final grade in the course.

Students will also be able to participate in online exams leading to the Smart Cities Specialization Certification for Technicians and Engineers, according to their qualification level.



The only requirement for participation in the online exams is to successfully complete the Smart Cities course + 1 additional course on digital skills (from 2.1.2 to 2.1.10) + 1 course on horizontal skills (2.1.11 - 2.1.12 - 2.1.13).

The complete description of the certification procedure is available in the deliverable “D2.4 Methodology for the certification of competences of Smart Cities technicians and engineers”.



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