essense

Education Supporting
Smart Environments for
Seniors

ESSENSE Joint Curriculum

Executive Summary

1st Version

Project Title	Higher Education Programme on Building Information Modelling towards the development of Smart environments for Seniors
Acronym	ESSENSE – Education Supporting Smart Environments for Seniors.
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	- buildingSMART e. V. (DE)
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	- Ss. Cyril And Methodius University in Skopje (MK)
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Document Track Changes

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The **main objective of ESSENSE**, co-funded by the Erasmus+ Programme of the European Union, is to develop and implement a Higher Education programme on Building Information Modelling to design and management of people with disabilities and seniors' environments according to their needs. The programme will comprise a joint curriculum, didactic materials and a collaborative platform in line with the needs of the different **target users** identified:

> Learners and workers from the AEC (Architecture, Engineering and Construction) and habitat sector interested in Building Information Modelling and Ambient Assisted Living. ESSENSE will add the necessary aspects to create new building concepts and solutions adapted to older adults and people with disabilities, which is becoming a real need in the sector.

ESSENSE will reinforce the Higher Education landscape related to people with disabilities and seniors' needs in their homes with a Building Information Modelling training course relating **Smart Housing** and **Ambient Assisted Living** principles and concepts.

In this brief document you could see an **overview of the planned training course** that will be developed in the framework of ESSENSE project.

You can find more information in the **project website**.

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BASICS CONCEPTS ON BIM

- **1.1** Introduction to BIM.
- **1.2** Paradigm shift in AEC sector
- **1.3** What are the main goals of BIM?
- **1.4** What are the main possible benefits by using BIM methods in the building and construction sector?
- **1.5** Obstacles to the introduction of BIM methods into the AEC sector
- **1.6** Brief description of main software used by BIM methods
- **1.7** Application of BIM Methods in the AEC Sector

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NEEDS OF THE SENIORS CITIZENS AND THEIR CARETAKERS

- **2.1** Characteristics and needs of older adults
- *2.2* Supporting the needs of older adults in the Built environment
- **2.3** Working with older adults and their caregivers
- **2.4** Human centric design strategies

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SMART HOUSING AND AAL PRINCIPLES

- **3.1** Ambient Assisted Living principles
- **3.2** Sensing and actuation
- **3.3** Signal processing basics
- **3.4** How do components communicate?
- **3.5** Industry examples and state of the art

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INTERACTIONS OF SMART HOUSING, BIM AND AAL PRINCIPLES

- **4.1** Integration of other disciplines into BIM planning methods
- **4.2** Consisten documentation of building as a base for Facility Management
- **4.3** Smart House and AAL aspects in planning
- **4.4** Smart House and AAL aspects during operation
- **4.5** Technical issues

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PROJECT MANAGEMENT, INNOVATION MANAGEMENT AND COLLECTIVE SKILLS FOR AN OPTIMUM IMPLEMENTATION OF BIM PRINCIPLES AND AAL CONCEPTS

- **5.1**. BIM Project Management
- **5.2** Innovation and Digital World
- **5.3** BIM Implementation Plan
- **5.4** Return on Investment (ROI) with BIM
- **5.5** BIM Framework Components to enable an accurate and consistent performance
- **5.6** Ambient Assisted Living Concepts

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UNIT 1. BASIC CONCEPTS ON BIM.

1.1 Introduction to BIM	Objective of the Unit and General Concepts
What is BIM?	The course unit prepares the participants for active and meaningful participation in a BIM-based procedure. The central aspect of these fundamentals is the communication of an open and regulated working method. It is characterised by an early networking processes between them. For this purpose, the fundamental aspects of the methods are theoretically presented and practiced.
Summary of the history of BIM	
Object oriented modeling in other industries	
1.2 Paradigm shift in the AEC Sector – from 2D to 3D Modelling	
1.3 What are the main goals of BIM?	
Differences to classical CAD based Methods	
Integrated building model for digital representation of all relevant aspects over full lifecycle	This unit is divided into 7 lessons. The first section gives a theoretically Introduction about the BIM method with classical tools. What is behind the term BIM?
Component oriented approach: Specification of building describing objects, linked by topology and described by different properties of aspect related attributes	The following section gives an insight into the paradigm shift in the AEC sector - How does the twist from 2D drawing to 3D modelling work?
Intelligent objects with business logic for specification modeling methods	The next section brings the students closer to the main goals of BIM. What are the differences to the classical CAD method?
Possible benefits of BIM methods 1/2	In section 4 the main advantages are shown in relation to the building and
1.4 What are the main possible benefits by using BIM methods in the Building and Construction Sector?	constructions sector. How do these fields benefit from the BIM method?
Continuous allocation of constant models for all involved partners	Section five is about the obstacles in the introduction of BIM methods in the AEC sector. What problems arise and how to avoid them.
Digitally available data for connecting all applications over the building's lifecycle	Section six gives the students a short description of the most important software used by BIM. Both, free and commercial software are studied.
Basis for early validation of building in ecological, economic, and design aspects (i.e., Life Cycle Costing)	The course unit ends with the International comparison and differences of application of the BIM-method in the AEC sector.
Improved decision-making process through reliable organised data.	
Higher quality reached through early matching and control of construction challenges	
Reduction of changes required during construction through reliable mass models	
1.5 Obstacles to the introduction of BIM methods into the AEC Sector	
Technical issues	
Culture issues	
Legal issues	
Educational issues	
1.6 Brief description of main software used by BIM	
Commercial software	
OPEN BIM / Industry Foundation Classes	
1.7 Application of BIM Methods in the AEC Sector	
International comparison and differences	

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UNIT 2. NEEDS OF OLDER ADULTS AND THEIR CARETAKERS.

2.1 Characteristics and needs of older adults	Objective of the Unit and General Concepts
Physical characteristics and needs	The objective of the unit is to prepare building designers, construction workers, and related professionals with knowledge, skills and competences required to make design decisions that support healthy active ageing, and to implement those solutions in new buildings and refurbishments. The course begins with an introduction to the psychological and physical needs of older adults, which are presented on their own and in contrast to what the students may be familiar with. The state of the art in available solutions will be presented in contrast with the state of implemented solutions in various countries based on reports and studies from the field. After gaining some knowledge of the challenges and some potential solutions, learners will be presented with methods to develop solutions to these challenges in partnership with users, and they will learn how user needs can be expressed throughout the design process.
Physical impairment	
Common accessibility needs	
Safety and health needs	
Physical activity requirements	
Psychosocial characteristics needs	
Cognitive impairment	
Personality and emotional changes	
Social relationships	
2.2 Supporting the needs of older adults in the built environment	
Accessibility in the built environment	
Solutions to accessibility issues	
Supporting the health of older adults	
Addressing physical impairment	
Addressing cognitive impairment	
Supporting psychological well-being	
General Building-for-Health solutions	
Solutions for Caregivers	
Link caregiver needs to solutions for older adults	
2.3 Working with older adults and their caregivers	
Common challenges in working with older adults	
Digital skills of older adults and their caregivers	
Technology adoption issues and how to overcome them	
2.4 Human centric design strategies	
Centering the user in design	
Eliciting needs (emotional, physical, social)	
Validating solutions with users and caregivers	

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UNIT 3. SMART HOUSING AND AAL PRINCIPLES.

3.1 AAL Principles	Objective of the Unit and General Concepts
Introduction to AAL, AmL and Smart Houses	The objective of the unit is to introduce the concept of AAL to the students. The students will be introduced to the advanced concepts of sensor data acquisition and processing from both hardware and software point of view. Students will learn thoroughly the concepts of sensing and smart environments and be able to apply these concepts in the design and building phases. Students will learn how to overcome the challenges in the design and implementation of a successful ambient assisted living system.

The unit is divided in 5 sections.
The first section introduces the basic principles, definitions and challenges. The second section describes the sensors as concept, as hardware and as combination of hardware and software. It also describes how information is transferred and introduction to security and what needs to be considered for a system to be secure and to consider the privacy of the users.
The final fifth section gives overview of the most successful case-studies and what is the current state of the art. |
What is considered Smart or Intelligent?	
History of AAL and Smart Housing	
Current challenges	
3.2 Sensing and Actuation	
How do Smart Houses see?	
How do Smart Houses know?	
How do Smart Houses react?	
3.3 Signal Processing Basics	
What are signals?	
How do we process signals?	
How do systems learn from signals?	
3.4 How do components communicate?	
Communication mediums	
Commnication layers	
Communication devices and protocols	
Security and Privacy considerations	
3.5 Industry examples and State of the Art	
Case-studies	
State of the Art	

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UNIT 4. INTERACTIONS BETWEEN BIM, SMART HOUSING AND AAL.

4.1 Integration of other disciplines into BIM planning methods	Objective of the Unit and General Concepts
Possible benefits of BIM methods	The course unit prepares the participants to combine the specific requirements of Ambient Assisted Living with the requirements of the BIM method. Participants will use their AAL knowledge to develop meaningful and workable design proposals for the living environments of older people. The unit provides student with transversal knowledge in fields of BIM, Smart Housing and AAL.
Principal advantages of a complete and central data model in planning	
4.2 Consistent documentation of buildings as a base for Facility Management	
4.3 Smart Houses and AAL aspects in planning	
Integration of hardware and software concepts into buildings during an early planning stage	
Planning considerations for sensors and actuators	
Planning for network communication	
Security considerations	The course unit begins with the possible benefits of the integration of other disciplines into the BIM planning method. This includes the possible advantages of the BIM method.
4.4 Smart House and AAL aspects during operation	
Using Facility Management to support AAL hard and soft aspects during operations	The second section deals with the Consistent documentation of buildings as a base for Facility Management.
Management of sensor devices (sensing quality consideration)	The next section is about Smart Houses and AAL aspects in planning. This section describes the Integration of hardware and software concepts into buildings during an early planning stage.
Management of sensor devices	
Management, access control, and security considerations during operation	Section 4 will introduce Smart House and AAL aspects during operation. The final section shows the students the technical issues in combination with the IFC format.
4.5 Technical issues	
Integration of AAL aspects into Industry Foundation Classes	
Integration of Sensor Data into IFC	

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UNIT 5. PROJECT MANAGEMENT, INNOVATION MANAGEMENT AND COLLECTIVE SKILLS FOR AN OPTIMUM IMPLEMENTATION OF BIM PRINCIPLES AND AAL CONCEPTS

5.1 Project Management	Objective of the Unit and General Concepts
BIM Manager	The objective of the unit is to train the learners in project management related to BIM, which includes innovation management, information management, working with transversal groups or cross-cultural competencies. The central aspect of the unit is management the information provided by BIM and its teamworks and how to assess this information to obtain quality outputs.
5.2 Innovation and Digital World	
Information Management	
Lean Innovation Management	
Innovation Map, Economic Value and Types of Innovation	
How to Associate Economic Value and Innovation	
Innovation Matrix by Greg Satell	
5.3 BIM Implementation Plan	This unit is composed by 6 sections. The first one comprises the knowledge about the tasks and responsibilities of a BIM Manager and the principles of Project Management.
Organisation Analysis	
Goals and Objectives of BIM Implementation	
Main Benefits of BIM Implementation	The second section introduces the learner to innovation management and its economic value, how to manage it and how to measure it, as well as some Lean Innovation concepts and principles.
5.4 Return on Investment (ROI) with BIM	
Design Agents, Building Agents and Subcontracts	
From Building Log Book to BIM Model as Built	The third section is about how to properly implement BIM and assess this implementation.
5.5 BIM Framework components to enable accurate and consistent BIM performance measurement	The fourth section will introduce the learner in the concept of return on investment with BIM.
BIM Capability Stages	
BIM Maturity Levels	The fifth section shows all the BIM components related to the BIM performance measurement and how apply it.
BIM Competency Sets	
BIM Organisational Scales	
BIM Granularity Levels	
Applying the five assessment components	
5.6 Ambient Assisted Living Concepts	The final section comprises knowledge on Ambient Assisted Living concepts and how to manage and measure the information obtained from them.
Reference Model for AAL Systems	
Reference Architecture for AAL Systems	
Evaluation of the Reference Model and Reference Architecture	
Ambient Assisted Living Quality Criteria (ISO/IEC 25012 & ISO/IEC 25010)	
Define a Data Quality Model for AAL Systems	

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