COURSE SYLLABUS

Developed within project

Heritage BIM - enhancing digital competences of students of Architecture

Subject name:	***Heritage BIM***
Mode of study:	*Full-time study*
Form of classes and number of contact hours per semester:	*30*
Lecture	–
Classes	–
Laboratory	*30*
Project	–
Number of ECTS credits:	*1*
Form of subject assessment:	*Laboratory*
Course language:	*English / Polish / Italian / Czech*

Subject objectives	
O1	*The student's educational journey encompasses a comprehensive understanding of the principles and practices associated with the development and modification of BIM (Building Information Modeling) models. This knowledge extends to two critical domains: firstly, the ability to work with existing structures, involving the adaptation and optimization of BIM models for structures that already exist in the real world. Secondly, the student is equipped with the expertise required to craft BIM models from scratch for newly conceived architectural projects. This multifaceted knowledge base ensures that the student is well-prepared to navigate the intricacies of BIM across a broad spectrum of applications, whether in the context of renovating historical landmarks or designing cutting-edge, innovative structures.*
O2	*Through a combination of theoretical instruction and hands-on experience, the student hones a diverse skill set centered around the creation, modification, and meticulous enhancement of BIM models. These skills extend beyond the surface-level representation of buildings and delve deeply into the incorporation of construction and architectural elements within the digital framework. The student becomes proficient in weaving together the intricate details of a structure, integrating architectural aesthetics with structural soundness. This proficiency equips them to produce BIM models that not only reflect the visual aspects of a design but also encapsulate the critical engineering and architectural considerations, fostering a holistic approach to building design and management.*

Preliminary requirements in terms of knowledge, skills and other competencies	
1	*Having computer skills: Acquiring and demonstrating proficiency in computer skills is the very first step in preparing for a career involving Building Information Modeling (BIM) and technical documentation. Students should feel comfortable navigating through software interfaces, and familiarity with keyboard shortcuts can significantly enhance productivity in BIM environments. Moreover, having the ability to troubleshoot common computer issues and perform basic maintenance is crucial to ensure uninterrupted workflow.*
2	*Having knowledge and skills in the principles of drawing technical documentation: Another critical element in the preparation for BIM and technical documentation roles is a strong foundation in the principles of technical drawing. This encompasses a wide range of knowledge and skills, from understanding orthographic projection to mastering dimensioning, scale, and line types. Proficiency in using drafting tools is essential, and this includes both traditional tools like pencils, pens, and rulers, as well as digital tools such as Computer-Aided Design (CAD) software. Moreover, a comprehensive grasp of industry standards and conventions for technical documentation, such as ISO standards or architectural drafting standards, is necessary to ensure that drawings adhere to recognized practices and can effectively communicate design intent.*
3	*Having knowledge and skills in the basic BIM techniques: Building Information Modeling (BIM) forms the heart of modern construction and architectural design processes. To engage effectively in this field, individuals must acquire a solid understanding of BIM principles. This includes grasping the central concept of a parametric 3D model that stores data about building components. Proficiency in the use of BIM software platforms, such as Autodesk Revit, ArchiCAD, or Bentley MicroStation, is a significant advantage. Familiarity with basic BIM operations, such as creating and editing BIM elements, setting up project templates, and managing project information, is essential for efficient BIM workflow. As BIM becomes increasingly integral to the construction industry, these foundational skills pave the way for more advanced practices like clash detection, collaborative project management, and data-driven decision-making within the BIM environment.*

Learning outcomes	
	In terms of knowledge:
LO1	*A student pursuing this program is equipped with a comprehensive knowledge base in the realm of designing and creating documentation for both newly designed structures and existing objects. They not only understand the principles and methodologies of documentation but are also well-versed in the regulations and standards governing the description and diagnosis of building elements across diverse architectural objects. This knowledge is essential for ensuring accuracy and adherence to industry best practices in architectural documentation.*
LO2	*Furthermore, students gain extensive knowledge regarding the materials and technologies employed in the construction industry. They delve into the intricacies of construction methods, techniques, and processes, developing an in-depth understanding of how construction works are executed. This knowledge encompasses not only the physical components of construction but also the technological aspects, which are crucial for effective decision-making and project management in the field.*
	In terms of skills:
LO3	*Beyond theoretical knowledge, students acquire practical skills vital for success in the profession. They learn to gather information pertaining to architectural objects, analyze and interpret this data, and organize it effectively. By applying these skills, students can meticulously identify and document all elements of a building, ensuring a detailed and accurate representation within a Building Information Modeling (BIM) framework. This skill set is essential for creating BIM models that reflect the real-world intricacies of architectural structures.*
LO4	*Collaboration and communication are key in the construction industry. Students are trained to employ information exchange techniques effectively, facilitating seamless communication between multidisciplinary construction teams. They become adept at collaborating with professionals from various construction industries, enabling them to engage in productive discussions on complex, industry-specific topics. This collaborative competency enhances the overall efficiency and quality of construction projects.*
	In terms of social competence:

LO5	*Social competence is a vital aspect of a student's development in this program. They are instilled with a strong sense of responsibility for their work, ensuring that they take ownership of their tasks and deliver results with integrity and professionalism. Recognizing the importance of seeking assistance when facing challenges, students are prepared to consult experts and collaborate with other team members. Furthermore, they are conscious of the ethical and economic principles that govern professional activities, emphasizing the need for ethical conduct and economic sustainability in their endeavors.*

Subject content	
Form of classes – laboratories	
L1	*Introduction to the Computer Program for Technical Building Information Modeling (BIM) and Creating Basic Documentation Based on Existing Documentation and Point Cloud* *In the first session, students will become acquainted with the functionalities of a computer program for technical BIM. They will learn how to efficiently navigate and use the software while focusing on creating basic documentation from existing records and point cloud data. This practical exercise will introduce students to fundamental Heritage BIM concepts and provide hands-on experience in translating real-world data into a digital BIM environment.*
L2	*BIM Model in Relation to Traditional and Historic Buildings* *This session delves into the unique considerations and challenges of working with traditional and historic buildings within the context of BIM. Students will explore how to adapt BIM methodologies to suit the preservation and restoration of historical structures. The class will discuss strategies for accurately representing and modeling these buildings while respecting their architectural heritage.*
L3	*Creating the BIM Model Based on Information Included in Existing Design Documentation and Introducing Specific Elements of the Structure and Architecture* *During this laboratory session, students will practically create a BIM model using existing design documentation as a reference. They will focus on incorporating specific architectural and structural elements into the BIM model, emphasizing precision and attention to detail. This hands-on exercise will allow students to gain proficiency in translating static documentation into a dynamic and informative digital model.*

L4	*Extracting Information from the BIM Model and Creating Detailed Technical Documentation* *In this class, students will learn how to extract valuable information from a BIM model. They will explore techniques for accessing and interpreting data embedded within the model, enabling them to create detailed technical documentation. This step is crucial for ensuring that accurate and comprehensive records are available for use in various stages of heritage conservation and management.*
L5	*Preparation and Printing of Drawing Documentation* *The final laboratory session focuses on the practical aspect of preparing and printing drawing documentation derived from the BIM model. Students will gain hands-on experience in producing well-organized and professionally presented documentation, which is essential for communication within the heritage conservation field. This class will underscore the importance of clarity and accuracy in delivering information derived from the BIM model to various stakeholders, including preservationists, architects, and contractors.*
L6	*Advanced BIM Techniques for Historical Structures* *Building upon the foundational knowledge gained in previous sessions, this class delves into advanced BIM techniques tailored specifically for historical structures. Students will explore methods for accurately capturing intricate architectural details, preserving historical significance, and effectively documenting structural changes over time.*
L7	*Geospatial Data Integration in Heritage BIM* *This session introduces students to the integration of geospatial data within the Heritage BIM context. They will learn how to incorporate geographical information and geographic information system (GIS) data to enhance the accuracy and context of their BIM models, especially when dealing with heritage sites in diverse locations.*
L8	*Laser Scanning and Point Cloud Processing* *Students will receive hands-on training in laser scanning techniques and point cloud processing. They will gain proficiency in capturing detailed 3D data of heritage structures using laser scanning technology and converting this data into usable point cloud models that can be integrated into the BIM environment.*
L9	*Documentation and Assessment of Material Properties* *In this session, students will focus on documenting and assessing the material properties of heritage structures. They will learn how to identify, record, and evaluate the condition of historical materials, such as masonry, wood, and*

	metals, for the purpose of accurate preservation and restoration planning within the BIM model.
L10	*Collaborative Heritage BIM Workflows* *This session emphasizes collaborative workflows within Heritage BIM projects. Students will explore strategies for effective communication and coordination among multidisciplinary teams involved in heritage preservation. They will learn to use collaborative BIM platforms and tools to streamline project management and information exchange.*
L11	*Heritage BIM for Site Management and Conservation* *This class focuses on the use of Heritage BIM for site management and conservation efforts. Students will learn how to leverage BIM to monitor and manage heritage sites, assess their condition, and plan conservation and restoration activities. Practical exercises will involve creating maintenance schedules and tracking site changes over time.*
L12	*Historic Building Energy Analysis with BIM* *Students will gain insights into the application of BIM for energy analysis in historic buildings. They will learn how to use BIM data to assess energy efficiency, identify opportunities for improvement, and make informed decisions regarding energy-related upgrades in heritage structures.*
L13	*Heritage BIM for Cultural Heritage Documentation* *This session focuses on the role of Heritage BIM in cultural heritage documentation. Students will explore methods for creating immersive digital documentation of heritage sites and artifacts, including 3D modeling and virtual reality applications for preserving and sharing cultural heritage.*
L14	*Preservation Ethics and Regulations in Heritage BIM* *This class delves into the ethical considerations and legal regulations associated with heritage preservation in the context of BIM. Students will explore the importance of adhering to preservation ethics and complying with heritage preservation laws and guidelines while using BIM for heritage conservation projects.*
L15	*Heritage BIM Project Presentation and Review* *In the final session, students will have the opportunity to present and review their Heritage BIM projects. They will showcase their skills and knowledge by presenting comprehensive BIM models and documentation for heritage structures. This session serves as a culmination of their learning journey, allowing for peer feedback and assessment of their proficiency in Heritage BIM.*

Didactic methods	
1	*Working with source materials (instructions containing a description, interpretation of results, and guidance on the format of the research report).*
2	*Teamwork for collaborative learning.*

Assessment methods and criteria		
Assessment method symbol	**Assessment method description**	**Passing threshold**
A1	*Creating an accurate BIM (Building Information Modeling) model of a historic object and preparing it for printing.*	*100%*

Student workload	
Student activity form	**Average number of hours needed to complete the activity**
Contact hours with the teacher, including:	***30***
Participation in the laboratory	***30***
Total student workload	***30***
Total number of ECTS credits for the subject	***1***

Co-funded by the Erasmus+ Programme of the European Union

Key Action 2: Strategic Partnership Projects

Contract nº 2020-1-PL01-KA203-081942