

# Environmental Risk Assessment and Mitigation on Cultural Heritage assets in Central Asia

## ERAMCA

ERASMUS+ CBHE Project nr. 609574



### Deliverable D2.2

Identification of developed focal topics

### Deliverable D2.3

Taxonomy of existing courses

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## 1. Introduction

Tasks 2.2, 2.3 The identification of developed focal topics from the list of existing study programs for undergraduate, graduate and doctoral programs KPITTU, TTU, TTPU and SamSACII, which are close to seismic engineering, hydrogeology, restoration (for example, civil, construction, environmental engineering, architecture, conservation), and also created a taxonomy of existing courses. Based on the strategic educational program of ERAMCA, certain key areas and topics, and a list of courses that covers the field of preservation of cultural heritage, the following topics have been taken into account: Hydrogeology, Seismology, Restoration, Urban planning, Geomatics, Structures, Geotechnics.

## 2. Identification of developed focal topics of KPITTU

Of the KPITTU curricula, 26 existing disciplines have been identified.

**Table 1.** 700101 - MANUFACTURE OF CONSTRUCTION PRODUCTS AND STRUCTURES (BACHELOR)

No	Discipline Name	ECTS Credits
1	Engineering Geodesy	6
2	Architecture	6
3	Engineering Geology	3

**Table 2.** 700201-CIVIL ENGINEERING (BACHELOR)

No	Discipline Name	ECTS Credits
1	Engineering Geodesy	6
2	Construction Materials	6
3	Architecture of low buildings	6
4	Reinforced concrete structures	8
5	Metal structures and welding	6
6	Elective Disciplines: Seismology	6
7	Elective Disciplines: Reconstruction of a building and structure	6
8	Elective Disciplines: Surveys of buildings and structures	6

**Table 3.** 57010101-ECOLOGY OF INDUSTRY AND THE RATIONAL USE OF NATURAL RESOURCES (BACHELOR)

No	Discipline Name	ECTS Credits
1	Engineering Cartography	6
2	Groundwater protection against pollution and depletion	6
3	Soil pollution control	6
4	Drainage network design	3

**Table 4.** 690101-ARCHITECTURE (BACHELOR)

No	Discipline Name	ECTS Credits
1	Fundamentals of Surveying and Terrain Planning	6
2	Basics of architectural design	6
3	Architectural and building structures	6
4	Theory of Architecture and Urban Planning	6
5	National Building Constructions	6

**Table 4 (cont.). 690101-ARCHITECTURE (BACHELOR)**

6	Architectural design of multifunctional buildings	6
7	Design in hot climates and earthquake resistance of buildings	6

**Table 5.700201- CIVIL ENGINEERING (MASTER)**

No	Discipline Name	ECTS Credits
1	Structural Dynamics	4
2	Structural stability and thin-walled spatial structures	4
3	Calculation of buildings and structures taking into account seismic effects	4

**Table 6. 6D072900- CONSTRUCTION (DOCTORAL STUDIES PhD)**

No	Discipline Name	ECTS Credits
1	Constructive and heat-insulating materials in construction	6

### 3. Identification of developed focal topics of TTU

Of the TTU curricula, 10 existing disciplines have been identified.

**Table 7. 690101-ARCHITECTURE (BACHELOR)**

No	Discipline Name	ECTS Credits
1	Fundamentals of Architectural Design	6
2	Fundamentals of Architecture	3
3	Educational Practice;’ (Architecture and Geodesy)	3
4	Architectural Design	54
5	Architectural and construction designs	6
6	Restoration of Architectural Monuments (Restoration)	3
7	Designing of urban development taking into account the historical and architectural heritage	6
8	Rural Environment Architecture	3
9	Architectural Designer	6
10	Renovation of buildings and structures	3

### 4. Identification of developed focal topics of TTPU

Of the Turin Polytechnic University in Tashkent (TTPU) curricula, 4 existing disciplines have been identified.

**Table 8. TTPU - BACHELOR**

No	Discipline Name	ECTS Credits
1	Geology / Safety and civil protection	8
2	Land surveying	8
3	Geotechnics	10
4	Structural Engineering	10

## 5. Identification of developed focal topics of SamSACII

Of the SamSACII curricula, 24 existing disciplines have been identified.

**Table 9.** 5340100- ARCHITECTURE (BACHELOR)

No	Discipline Name	ECTS Credits
1	Engineering Geodesy	2
2	Architectural Constructions	4
3	History of Architecture	4
4	Architectural Design 1	8
5	Architectural Design 2	6
6	History of Architecture	4
7	Engineering constructions	8
8	Engineering facilities of buildings	4
9	Architectural Design 3	6
10	Architectural Design 4	6
11	Restoration and Reconstruction of Architectural Monuments	22
12	Urban Design	12

**Table 10.** 5340200-CIVIL ENGINEERING (BACHELOR)

No	Discipline Name	ECTS Credits
1	Construction Materials	4
2	Engineering Geodesy	8
3	Architecture of buildings	4
4	Architecture of civil and industrial buildings	4
5	Construction Materials	4
6	Metal constructions	8
7	Reinforced concrete structures	12
8	Seismic resistance of Buildings	4

**Table 11.** 5434010 - THEORY AND HISTORY OF ARCHITECTURE, RESTORATION OF ARCHITECTURAL MONUMENTS (MASTER)

No	Discipline Name	ECTS Credits
1	Architectural monuments of Uzbekistan	8
2	Scientific basis for the revival of historical city centers	8
3	Harmonizing and decorating architectural forms	4
4	Reconstruction and use of Architectural Monuments	4

## 6. Taxonomy of existing courses of KPITTU, TTU, TTPU and SamsACII

Suggestion is to relate the above mentioned courses with these descriptions i.e. focal areas and to include them into the table with e.g. (B) for bachelor and (M) for master level

**Table 12.** Classification of the different courses and their description based on proposed focal areas and topics

	Course	Description	Focal areas				
			Hydrogeology and Hydro- and Geotechnics	Earthquake and Structural Engineering	Restoration	Urban planning	Geomatics
<b>KPITTU</b>	Groundwater protection against pollution and depletion	Prevention of pollution and depletion of groundwater and adverse effects from these phenomena is the main task of protecting groundwater, a new direction in hydrogeology that has been developing in recent years. Groundwater pollution causes deterioration of their properties and composition, limiting or even not allowing the use of groundwater (for drinking, household, irrigation and other purposes)	+				
	Soil pollution control	In the process of studying this discipline, students are invited to familiarize themselves with the main features of soils and soils, the functions of soils, the causes of their degradation, rationing of chemical pollution of soils, methods of field research of soils, physical and chemical properties of soils and their laboratory studies, environmental soil monitoring. In addition, economic calculations are proposed for calculating the amount of damage caused to soils as an object of environmental protection and calculation of damage from land degradation.	+				

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Drainage design	Drainage network	General provisions for engineering protection of territories from flooding. Causes of flooding of territories. Tasks of water reduction. The rate of drainage. Classification of drains. Water drainage ability. Drainage collectors. Drainage wells. Classification of drainage systems. Design of drainage systems. The sequence of designing drainage systems. The location of the drains in a vertical plane. Location of drainage systems in plan. Design of high-altitude position of drainage systems. Hydraulic calculations of drainage systems.	+				
Engineering geology		The science of the geological cycle, a branch of geology that studies the morphology, dynamics and regional features of the upper horizons of the earth's crust (lithosphere) and their interaction with engineering structures (elements of the technosphere) in connection with the ongoing, ongoing or planned economic, primarily human-building, construction activity.	+				
Seismology		Seismology is a science that studies the propagation of seismic waves in the bowels of the Earth, earthquakes, the causes that cause them, related phenomena and the structure of the Earth. Seismic waves are the main carrier of information in seismology. They are recorded at seismic stations. Seismic waves characterize not only the source of the earthquake, but also the medium through which they propagate.		+			
Design in hot climates and earthquake resistance of buildings		Designing buildings in hot climates. Features of space-planning and structural solutions. Measures to reduce solar radiation. Orientation of buildings to the cardinal points. The concept of earthquake-resistant construction. Fundamental principles for the construction of earthquake-resistant buildings.		+			

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Calculation of buildings and structures taking into account seismic effects	To protect the bearing systems of the designed buildings and structures from possible erroneous decisions, it is important to have sufficient knowledge about the nature of seismic phenomena, calculation methods, the principles of operation of building structures, an understanding of the provisions of the current regulatory framework. Calculation of buildings and structures for seismic effects is one of the most complex calculation justifications of load-bearing structures, which raises many questions in real practice. The course will provide a clear understanding of how to correctly perform such calculations.					+
Reinforced concrete structures.	The purpose of the discipline is to prepare bachelors in industrial and civil engineering of a wide profile with the study of the basics of calculation and design of reinforced concrete structures.					+
Metal structures and welding	The content of the program covers the design and calculation of metal structures and structures used in construction; the main provisions of the methodology for calculating metal structures; highlights the methods of designing and calculating new effective structural elements; focuses on the need to save steel in construction, on the manufacturability of structures and on the use of the most rational structural forms.					+
Construction Materials	A brief description of the discipline - allows you to master the material science fundamentals of obtaining building materials with the required properties, ensuring high performance, environmental cleanliness, economy, aesthetics and durability of materials.					+



**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

National Building Constructions	The purpose of the discipline is the formation of a complex of knowledge, skills in the field of rational design of structural and space-planning decisions of buildings and structures using national features, their technical operation and structural safety.	+			
Structural Dynamics	The discipline "Structural Dynamics" aims to familiarize a future specialist with the methods of calculating structures and structures for dynamic effects, wind and seismic loads used in the design and strength calculations of structures of buildings and structures.	+			
Structural stability and thin-walled spatial structures	The discipline "Structural stability and thin-walled spatial structures" aims to familiarize the future specialist with the methods of shell theory used in the design and strength calculations of thin-walled spatial structures of buildings and structures.	+			
Constructive and heat-insulating materials in construction	The formation of students' ideas about the functional relationship of material and construction that determines the choice and optimization of the properties of heat-insulating materials, based on the purpose, durability and operating conditions of the structures; the study of the compositions, structure and technological fundamentals of obtaining heat-insulating materials with specified functional properties using natural and man-made materials; the study of quality control methods of heat-insulating materials.	+			
Architectural and building structures	The discipline "Architectural and building structures" is one of the fundamental areas of professional formation of the design training of architects. The goals of teaching and studying the discipline are to obtain and assimilate by students: Fundamental knowledge about the fundamentals of building art, products and structures that make up buildings and their individual parts, the purpose and relationship of structural elements, their role in architectural decisions.	+			

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Reconstruction of buildings and structures	The purpose of mastering the discipline "Reconstruction of buildings and structures" is the acquisition by students of knowledge and practical skills in the field of reconstruction of buildings using optimal technical and technological solutions.				+	
Survey of buildings and structures	The purpose of the discipline " Survey of buildings and structures" is to prepare a specialist who knows and knows the safety of buildings and structures, is able to conduct a survey of materials, structures, buildings and structures in general.				+	
Architecture	This discipline sets out the general principles of building design, discusses their types, basic architectural and planning and structural elements, structural systems and their role in the formation of space-planning and architectural-compositional solutions of buildings and structures, the basics of urban planning, planning and development of urban and rural settlements.				+	
Architecture of low buildings	The purpose of the discipline is the acquisition by students of information about low-rise buildings from small-sized elements, methods of space-planning decisions and functional design basics.				+	
Basics of architectural design	The discipline "Basics of architectural design", based on prototyping, as a method of subject and spatial modeling, consists in the spatial-spatial expression of our ideas about the abstract form or about the original in the layout material and serves to refine, develop and verify these ideas.				+	
Architectural design of multifunctional buildings	The objectives of the discipline: to reveal to students the main provisions that determine the features of the architectural design of residential buildings and public multifunctional complexes of complex structure; master the necessary professional skills that will allow you to competently and confidently make independent decisions; to teach the implementation of modern research in design development.				+	

**Table 12 (cont.).** Classification of the different courses and their description: based on proposed focal areas and topics

	Theory of Architecture and Urban Planning	To form students' general cultural and professional (research, communicative, critical and expert, pedagogical) competencies based on knowledge of modern trends in architectural science and practice, as well as ideas about architecture as an object of scientific research				+	
	Engineering cartography	Teaching students the theoretical and practical foundations of cartography, modern methods and technologies for creating, designing and using thematic, including cadastral and land surveying plans and maps.				+	
	Fundamentals of Surveying and Terrain Planning	To form a general idea of the means and methods of geodetic work in geological and topographic-geodetic surveys, the use of ready-made planning and cartographic materials in the search and exploration of mineral deposits in production, technological, design and survey, organizational, managerial and research activities.				+	
	Engineering Geodesy	The goal of the engineering geodesy course is to master the geodetic instruments and methods of performing geodetic works to the extent necessary for the survey, design, construction and operation of structures. The course is studied by students in two semesters and contains basic information on engineering geodesy and information corresponding to the profile of the specialty.				+	
TTU	Restoration of Architectural Monuments	The goal of the program is to study the holistic systemic approach that has evolved over time to the conservation and restoration of architectural monuments and its environment, when each action in relation to an art monument is conceptualized not only technically, but also ethically and aesthetically.			+		
	Renovation of buildings and structures.	The purpose of mastering the discipline "Renovation of buildings and structures" is the acquisition by students of knowledge and practical skills in the field of reconstruction of buildings using optimal technical and technological solutions.			+		

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Fundamentals of Architecture	The purpose of the discipline "Fundamentals of Architecture" is the formation of fundamental knowledge about the classification of buildings; about space-planning and structural elements of buildings and the requirements for them; about the basic structures of buildings and structures, as well as skills in the theory and practice of architectural and civil engineering design of civil, industrial buildings and structures.					+
Fundamentals of Architectural Design	The discipline "Fundamentals of Architectural Design", based on prototyping, as a method of subject and spatial modeling, consists in the spatial-spatial expression of our ideas about the abstract form or about the original in the layout material and serves to refine, develop and verify these ideas.					+
Architectural Design	The purpose of teaching the discipline "Architectural Design" is one of the main majors in architectural education. The main goal of this discipline is the development by students of practical knowledge of building classical architectural forms, parts of buildings, the study of architectural graphics and the foundations of architectural design, familiarization with the historically established terminology of the specialty.					+
Designing of urban development taking into account the historical and architectural heritage	The purpose of the discipline is to study the legislative framework for the protection of architectural heritage in the context of architectural and urban planning activities, to obtain a systematic understanding of the relationship between architectural heritage and urban planning activities for the harmonized development of cities and creating a comfortable urban environment; the formation of an aesthetic worldview based on knowledge of the historical and cultural environment.					+

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Rural Environment Architecture	The purpose of mastering the discipline is to familiarize yourself with the basic theoretical concepts, methods of designing, researching and modeling the architecture of suburban environment objects, as well as the formation of scientific and creative concepts for organizing a comfortable and safe residential and industrial environment in settlements.					+	
Architectural Designer	The purpose of mastering the discipline is the formation of a student's developed compositional consciousness, the ability to find adequate plastic solutions that respond to the features of the environmental context, based on the conclusions of the pre-project analysis. The development of the discipline is aimed at the formation of competent, creative, critical-thinking and highly moral designers in architecture, responsible for the quality and well-being of the environment.					+	
Educational Practice (Architecture and Geodesy)	The goals of educational geodetic practice: are to consolidate the materials of the theoretical course "Geodesy", familiarize students with field methods of engineering and geodetic work, and acquire students practical skills and competencies in the field of professional activity.						+
Architectural and construction designs	The purpose of mastering the discipline is to study students with theoretical approaches and practical methods for solving structural problems in architectural design and choosing the architectural concept for the reconstruction of buildings and structures. The knowledge gained is consolidated by performing practical work on discipline topics aimed at the integrated solution of tasks to ensure the basic requirements for the basic structural elements and structural schemes of buildings and structures.				+		

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

TTPU	Geology / Safety and civil protection	The objectives of mastering the discipline "Geology" are the development of spatial imagination and the formation of systematized knowledge in the field of geology. To the analysis and synthesis of spatial geological forms, obtaining practical skills in the field of geological forecasting, processes and modeling of paleogeographic situations using modern CAD systems.	+			
	Land surveying	The purpose of the discipline is to master the basic information about geodetic measurements performed on the Earth's surface, their mathematical processing, methods of compiling maps and plans and vertical profiles, training in the implementation of planned and high-altitude ground-based geodetic surveys, the mathematical processing of the results of field measurements, the solution of individual engineering problems necessary in the construction of buildings and structures.				+
	Structural Engineering	The purpose of mastering the discipline is the formation of knowledge, abilities, volumetric-planning and structural solutions of buildings for civil and industrial purposes; architectural and aesthetic foundations for the design of civil and industrial buildings and structures; the construction and reconstruction of buildings and structures for various purposes and complexity.		+		
	Geotechnics	The purpose of teaching this discipline is to master the fundamentals of theoretical and practical knowledge in the field of engineering geology in relation to civil engineering, the basics of soil mechanics - the theory of dispersed (fragmented) soil media, foundation engineering and underground construction. This will allow to correctly assess the engineering and geological conditions of the construction site, the degree of stability of soil masses; to improve the building qualities of soil bases; assign the main dimensions of foundations, underground and above-ground structures, at which their durability and profitability would be ensured; choose the methods of construction of foundations and underground structures without violating the natural structure of the soil base.	+			

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

<b>SamsACII</b>	Seismic resistance of buildings	The goal of mastering the discipline “Seismic resistance of buildings” is the formation of knowledge, skills in the calculation and design of structures of buildings and structures constructed and operated in seismic areas.	+			
	Restoration and Reconstruction of Architectural Monuments	The purpose of studying the discipline is to develop the skills of holistic awareness of the formative processes of architecture, teaching methods of stylistic analysis of architectural monuments, an in-depth study of the history of architecture, holistic awareness of the methodology in architecture and restoration of architectural heritage.	+			
	Reconstruction and use of Architectural Monuments	The objectives of the study of the discipline: the development of a wide range of modern methods of applied scientific research in the field of architecture and urban planning. Tasks of studying the discipline: the formation of knowledge and skills among undergraduates in the examination of architectural monuments, preparation and conduct of architectural and historical-cultural examinations, improvement of the experience of archival and bibliographic search and analysis of source materials.	+			
	History of Architecture	The purpose of the discipline "History of Architecture" is the formation of ideas about the development of architecture as a fundamental science, the acquisition of skills and abilities to apply the methods of knowledge of architectural forms for research and solving applied problems in architectural design; determining the training of students.				+
	Architectural Design 1,2,3,4.	Education in architectural design aims to form the basis of professional consciousness among students, to develop primary skills of compositional and spatial thinking, to develop an attitude towards creative activity and to determine the individual professional qualities of a future architect, to lay the foundations of artistic taste.				+

**Table 12 (cont.).** Classification of the different courses and their description based on proposed focal areas and topics

Urban Design	The purpose of the discipline "Urban Design " is to provide students with basic competencies in the design of urban spaces of various types and their elements. Urban spaces are formed under the influence of many factors and over long periods of time.					+
Architecture of civil and industrial buildings	The goal of the course "Architecture of civil and industrial buildings" is the architectural training of future specialists, which provides the fundamental direction in the formation of a civil engineer. The course sets out the functional, technological and aesthetic problems of architecture, its integrity in the integrated presentation of creative work in the field of design and construction of buildings and structures for various purposes.					+
Architectural monuments of Uzbekistan	The aim of the course is the formation of a knowledge system and the organization of focused cognitive activity of students to study the historical and architectural potential of Uzbekistan. The features of the historical and cultural heritage of Uzbekistan are studied, covering both the heritage monuments themselves and the environment in which they exist; know the legislation in the field of monuments and conservation.					+
Harmonizing and decorating architectural forms	The objectives of the discipline "Harmonizing and decorating architectural forms": the formation of students' understanding of the factors that determine the harmonization of elements in interior decoration, a holistic and systematic idea of various artistic techniques that can emphasize the chosen design style; the formation of knowledge among students on the techniques of finishing objects of art design, emphasizing the stylistic features of the interior.					+
Scientific basis for the revival of historical city centers	The goals of mastering the discipline are to form students' understanding of the cultural and historical heritage and the main cultural and historical centers in the context of the world cultural and historical tradition, to consider the largest monuments of the world cultural and historical heritage.					+



