Fundamentals of BIM design and documentation

Field of study (Kierunek):

Civil Engineering (Budownictwo)

Subject Description Card (Karta Opisu Przedmiotu)

ISCED 2013-F Field of study: Building and civil engineering (code: 0732)

Name of the subject						Subject code	Semester
Fundamentals of BIM design and documentation *Podstawy projektowania i dokumentacji BIM*							**Spring**
Subject		**Profile**				**Level of education**	
Facultative		**General academic**				**Full-time**	
Type of classes							**ECTS**
Lecture	**Practice**	**Laboratory**	**Project**	**Seminar**	**Exam**		
15	**-**	**15**	**30**	**-**	**NO**		**6**
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I. Card subject	
PURPOSE OF THE SUBJECT	
C01	An introduction in the topics concerning Building Information Modeling (BIM).
C02	Familiarization with the basics of BIM and the organization of a teamwork environment.
C03	Acquiring basic knowledge in the field of spatial modeling of objects using computer programs with the use of BIM design and modeling.
PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES	
1	Computer skills.
2	Basics of using AutoCAD.
LEARNING OUTCOMES:	
Knowledge: the graduate knows and understands	
EK1	The student has knowledge of the basics of building information modeling and preparing BIM documentation. The student knows and understand the capabilities of BIM software, including Revit in detail.
Skills: the graduate can	
EK2	The student is able to implement the basic rules of BIM modeling and design in 3D model. The student can work in BIM software, including Revit in detail. The student can built architectural and structural models using BIM technology. The student is able to work in CDE.
Social competence: the student is ready to	
EK3	work individually and in a team.

PROGRAM CONTENT		
Type of classes - Lecture		**Number of hours**
L1	Introduction to the subject. Information on passing the subject (and its parts) and final grade. Basic informations about BIM technology.	1
L2	Digital design. Visualization. Modeling techniques: parametric and direct. CDE platform.	1
L3	Electronic documentation of the building. Types of formats used to support design documentation. BIM electronic documentation.	1

L4	BIM model – rules for correct data implementation. Types of BIM models and coordination of work on models.	2
L5		
L6	Discussing the essence of designing and modeling structures using BIM systems.	1
L7	Modeling the structure in the selected BIM calculation system.	3
L8		
L9		
L10	Methods for inter-discipline coordination and clash detection, model merging, cost estimation and investment management based on BIM.	1
L11	BIM software. BIM viewers and free applications. Detecting clashes and errors in IFC models.	1
L12	Principles of collecting loads. Characteristics of loads.	1
L13	Building models for various construction variants, the impact of changes in individual model parameters on the performance of the structure.	1
L14	Data exchange between different BIM systems.	1
L15	Test.	1
	TOTAL:	**15**

PROGRAM CONTENT		
Type of classes - Laboratory		**Number of hours**
Lab1	Health and Safety training. Discussion of the subject card and requirements for passing the subject. Discussion of the form and content of assignment.	1
Lab2	Common Data Environment Platform - organization of space in the chosen cloud.	2
Lab3		
Lab4	Documentation in assignment.	2
Lab5		
Lab6	Modeling taking into account the division into IFC structure, element type and layers in the selected BIM program.	2
Lab7		
Lab8	Building a model in a program for static calculations and structure dimensioning (profile databases, bar types, basic static diagrams of the structure).	2
Lab9		
Lab10	Exchange of information between BIM programs. IFC file exchange format.	1
Lab11	Static calculations of the modeled structure in a selected construction program.	2
Lab12		
Lab13	Analysis of static calculations.	1
Lab14	Preparation of documentation of the calculations for the work.	1
Lab15	Completion of the assignment.	1
	TOTAL:	**15**

PROGRAM CONTENT		
Type of classes - Project		**Number of hours**
P1	Discussion of the syllabus and course requirements. Introduction to Autodesk Revit. Basic drawing settings, workspace, importing and merging AutoCAD drawings.	2
P2	Residential building project. Defining the grid system and levels. Material library.	2
P3	Residential building project. Defining and modeling walls and foundations.	2
P4	Residential building project. External, internal, load-bearing, and partition walls – first floor. System families (windows, doors).	2
P5	Residential building project. Ceilings, chimney, stairs, and railings. Residential building project. Next floors. 3D control methods.	2
P6	Residential building project. Roofs modeling. Creating a terrain model. Defining 3D views.	2
P7	Residential building project. Project documentation: dimensioning, floor plans, schedules, sheets.	2
P8	Residential building project. Rendering views and creating animations.	2
P9	Residential building project. Passing the project. Office building modeling. Importing AutoCAD drawings. Defining the grid system and levels.	2

P10	Office building modeling. Inserting steel and reinforced concrete columns. Adding beams and floor slabs.	2
P11	Office building modeling. Curtain walls and flat roof.	2
P12	Office building modeling. Project documentation: dimensioning, floor plans, schedules, sheets.	2
P13	Cloud collaboration. Mobile applications: BIM 360 Glue/Field as tools for working with BIM models on-site.	2
P14	Discussion of the syllabus and course requirements. Introduction to Autodesk Revit. Basic drawing settings, workspace, importing and merging AutoCAD drawings.	2
P15	Residential building project. Defining the grid system and levels. Material library.	2
	TOTAL:	**30**

BASIC AND ADDITIONAL LITERATURE	
Basic literature:	
1.	Revit Architecture 2024. User Manual. Autodesk, Inc. 2024.
2.	CAD to BIM Integration Manual. Autodesk 2019.
3.	Imtaar M., Complete Technical Bim Project Using Autodesk Revit: Architecture - Structure – MEP, Createspace Independent Publishing Platform 2016.
4.	Ingibjörg Birna Kjartansdóttir, Stefan Mordue, Paweł Nowak, David Philp, Jónas Thór Snæbjörnsson: BUILDING INFORMATION MODELLING BIM, biblioteka menedżera budowlanego, ERASMUS+ 2015-1-PL01-KA202-016454, Islandia, Wielka Brytania, 2017
5.	Garber R.: BIM Design. Realising the Creative Potential of Building Information Modeling, John Wiley & Sons Inc., United States 2014.
6.	Eastman C., Teicholz P., Sacks R., Liston K., BIM Handbook. A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Constructors. John Wiley & Sons Inc., Canada, 2008
7.	Kymmell W., Building Information Modeling. Planning and Managing Construction Projects with 4D CAD and Simulations, McGrawHill Construction, USA, 2008.
8.	PN-EN standards.
Additional literature:	
1.	Scientific journals related to the subject matter.