1. Course number and name

RB-S1-19-W18-1E, **BIM Basics**

2. Credits and contact hours*

2 ECTS, lectures: 15 hours**, laboratory: 15 hours**

3. Instructor's or course coordinator's name

Marek Salamak PhD, DSc/University Professor

4. Text book, title, author, and year

- Eastman C., Teicholz P., Sacks R., Liston K., BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors, John Wiley & Sons
- Jackson P., Construction Manager's BIM Handbook, Wiley Online Library

a. other supplemental materials

- ISO 16739 Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries.
- ISO 29481 Building information models — Information delivery manual.
- ISO 12006 Building construction — Organization of information about construction works.
- ISO 19650 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling.

5. Specific course information

a. brief description of the content of the course (catalog description)

Lectures:

Limitations of traditional construction. Industry digitization and the role of BIM. Construction 4.0. The CAD-BIM evolution. Basic definitions. Introduction. Maturity levels. World and Poland. CAD-BIM comparison. Benefits of BIM. Creating an object-oriented BIM model. 3D mapping. Information carrier. Multidimensionality. LOD / LOI. Data standards and formats. Interoperability. Open BIM. Standardization. IFC. IDM. IFD. BCF. COBie. Classifications. Information and management processes. Contract documents. Roles of people. EIR. BEP. CDE. Related issues. Lean. IPD. Life cycles. Asset Management. Facility Management. Related technologies. VR +. VDC. Graphic programming. Generative design. Artificial intelligence. Digital twins. SHM monitoring. GIS. 3D reconstruction. UAV. Automation and robotization. 3D printing. BIM in the facility's lifecycle. Projects. Building. Maintenance. BIM for stakeholders. Investor. Designer. The Contractor. Supervision. Manager. Manufacturer. Official. Implementation strategies. The digitization of the procurement market. Copyright. Initiatives. Expectations. Education. Pilotages.

Laboratory:

Modeling simple objects in 3D space, model line and detail line. Modeling of elements of a single-family residential building. Basic model elements: beams, columns, ceilings, walls, foundations and roofs. Additional elements of the model: stairs, doors and windows, handrails, finishing elements and terrain. Extract of data from a single-family residential building model: drawing sheets, dimension lines, bill of materials. Model for numerical analyzes, IFC model. Selected aspects of creating families: the idea of families in the Revit environment, definition of a parameterized beam model. Advanced problems of creating families: nested families, inherited parameters, ties. Basics of Dynamo graphical programming: basic mathematical rules and geometry support from the level of graphical code. Team work on BIM models. Central model, local models, data

synchronization, information exchange and collisions. Extensions and plugins in the Revit environment, API. C # text programming: functional programming, object-oriented programming.

b. prerequisites or co-requisites

No prerequisites and additional requirements.

c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

Required.

6. Specific goals for the course

a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic

The student:

- knows the basics of BIM technology, understands the terminology, knows the areas of application, knows what maturity levels, dimensions of BIM 3D models / 4D / 5D / 6D / 7D /,
- has knowledge of IPD processes, concurrent work, understands the differences between CAD and BIM. Understands the need to support open standards in BIM modeling, interoperability of BIM systems.describe selected structural systems and basic mechanisms of load transfer,
- can make simple BIM models of various types (architectural, construction, installation), can generate views, sheets, statements, visualizations,
- is able to import / export CAD data and models from / to other programs. He can create variant models, can perform simple structural, lighting, energy and environmental analyzes,
- is able to work in a group, share and exchange models, use OpenBIM standards,
- is aware of the need to coordinate cross-industry information, model development in IPD teams, Lean Construction principles (respect for partners, increasing the value stream for the client, the advantages of minimizing life cycle costs, the importance of environmental and pro-ecological parameters).

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

K2A_W02, K2A_W04, K2A_U07

7. Brief list of topics to be covered

1. Introduction to BIM: BIM levels, the level of detail of the Level of Detail (LOD) model, the level of information in the Level of Information (LOI) model, integrated project delivery (IPD),
2. OpenBIM, IFC classes (Industry Foundation) Classes), etc. Presentation of available BIM tools. Presentation of important BIM issues: e.g. inter-branch coordination, information flow management, extended and facilitated possibilities of various analyzes, etc. (different for different specialties).
3. Technologies and issues related to BIM. IPD, LCA, IAM, VR/AR/MR, AI, GIS, UAV,, SHM, Digital Twins, 3D printing.
4. Summary of the BIM educational path to date and an indication of the next educational stages of BIM.

*- Consultations were not included in the contact hours
**-per semester