



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Construction project engineering in BIM [N2Bud1-IPB>PPBwBIM]

### Course

Field of study

Civil Engineering

Year/Semester

2/3

Area of study (specialization)

Construction Engineering and Management

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

10

Laboratory classes

18

Other

0

Tutorials

18

Projects/seminars

0

### Number of credit points

5,00

### Coordinators

dr inż. Tomasz Wiatr

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### Lecturers

### Prerequisites

Knowledge: Knowledge of general construction, including designing of simpler building structures, and knows the basic methods of organization and planning in general construction. Skills: Knows how to develop a cost estimate using the detailed method and a simpler network model (technological and organisational) as the basis for the schedule and its check charts. Social competences: Possesses basic competence in the management of construction projects and demonstrates a desire to continually expand his knowledge of construction industry.

### Course objective

Development of the competences of a civil engineer as a manager in the construction industry, including a buildings designer, project planner and construction manager in the context of product and process optimization, taking into account harmonization in time and space. Designing of buildings, their components and construction in terms of Open BIM with the IFC format of interoperability. Planning the project as a complex of buildings and structures as well as technical infrastructure of the construction site. Group remote working using Open BIM class CDE cloud and data in international standard formats. Component modelling of buildings and their optimisation for purposes of construction design and production process management on and off site.

## Course-related learning outcomes

1. Knowledge of rules for the implementation of a investment in accordance with PM guidelines.
2. Knowledge of principles of managing production and logistics processes in modern construction.
3. Knowledge of computer methods of designing production processes in general construction.

### Skills

1. Ability to identify the scope of works on the basis of classic and electronic design documentation in terms of Open BIM and conduct quantitative and qualitative analyzes of BIM models.
2. Ability to develop a general and detailed network logistic and financial schedule for the construction of a building in computer terms integrated with the cost estimate and BIM model and derivatives.
3. Ability to identify key safety and risk factors in a given production process and deal with them preventively by design methods.

### Social competences

1. Ability to work efficiently in a construction organization observing the rules of professional ethics.
2. Ability to work in a team and communicate effectively on the way to achieving the project goal.
3. Ability to formulate conclusions on the rational improvement of construction processes.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Checking the effects includes: a written exam from the lecture part in the form of a workshop, a written test from the auditorium part and an assessment of the laboratory and project elaboration, taking into account consulting activity and additionally attendance at classes.

## Programme content

With a key division into lecture (theory and methods overview), audit exercises (analytical methods and analysis examples), laboratories (problem work with software) as complementary parts. The basis is an investment project involving the construction of a large residential development comprising 10 repetitive residential buildings, 10 non-residential buildings of various types, several above- and below-ground structures, plant for multidimensional prefabricated elements and concrete mixture as well as permanent and temporary facilities. The link is made by the audit exercises which combine a complex problem from the laboratory part with the separated issues, which the enriches the lecture with complementary themes. The lecture culminates in an examination that relates to the overall knowledge presented in all parts of the course.

## Course topics

Project in building engineering, construction phase as the purpose of design documentation, information about the building in terms of Open BIM with IFC format. Analysis of building structures, classification and technical specifications of components. Model quantification and take-offs, conversion of construction product information into production processes. Estimation and data analysis in terms of BIM with analyzes of active and passive resources as well as fixed and variable costs. Two-point deterministic network model and basics of risk analysis in terms of the PERT. Material and financial schedule of construction in terms of 5D BIM and derivatives, harmonization with the method of flow work. Safety and health plan integrated with the 4D BIM construction phase model. Construction logistics, planning of deliveries, consumption and stock as well as transport.

## Teaching methods

1. Lecture: slide and projector presentations, oral explanations, sketches and software demonstrations.
2. Tutorials: graphical and analytical methods, as well examples supporting the project work parts.
3. Laboratories: work in computer laboratory, practical designing problems in planning process.

## Bibliography

1. ArCADia-System. Podręcznik użytkownika dla programu ArCADia. ArCADiasoft, Łódź 2020.
2. BIMestiMate. Podręcznik użytkownika. Opis funkcji programu. Datacomp, Kraków 2017.
3. BIM Vision. Opis funkcjonalności programu. Datacomp, Kraków 2017 <https://bimvision.eu/tutorials>
4. Biernacki J., Cyunel B., Metody sieciowe w budownictwie. Arkady, Warszawa 1989.
5. Ciołek R. - red., Kompleksowa mechanizacja produkcji budowlanej. Arkady, Warszawa 1985.

6. Jaworski K. - red., Metodologia projektowania realizacji budowy. PWN, Warszawa 2009.
7. Kacprzyk Z., Projektowanie w procesie BIM. Oficyna Wydawnicza PW, Warszawa 2020.
8. Rowiński L., Organizacja produkcji budowlanej. Arkady, Warszawa 1982.
9. Wiatr T., Modelowanie przedsięwzięć budowlanych w ujęciu 4D/5D BIM i komponentów z klasami LOD. Przegląd budowlany 11-12/2022.

#### Additional

1. Allplan BIM compendium theory and practice. Nemetschek Allplan Systems 2014.
2. Barnes P., BIM for project managers: digital construction management. Institution of Civil Engineers 2020.
3. Hardin B., McCool D., BIM and construction management. Proven tools, methods and workflows. Wiley 2015.
4. Eynon J., Construction managers's BIM handbook. Wiley Blackwell, 2016.
5. Schreyer, A. Interactive SketchUp exercises. Supplemental teaching resources for Allen F., Iano J. Fundamentals of building construction: materials and methods. Wiley 2019.
6. Simonovski V. F., SketchUp for civil engineering and heavy construction: modeling workflow and problem solving for design and construction. McGraw Hill 2021.
7. Trimble Connect User Guides <https://connect.trimble.com/support>

#### Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	48	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	77	3,00