Politechnika Krakowska im. Tadeusza Kościuszki

Karta przedmiotu

obowiązuje studentów rozpoczynających studia w roku akademickim 2019/2020

Wydział Inżynierii Lądowej

Kierunek studiów: Budownictwo

Profil: Ogólnoakademicki

Forma sudiów: stacjonarne

Kod kierunku: BUD

Stopień studiów: I

Specjalności: Bez specjalności - studia w języku angielskim

1 Informacje o przedmiocie

Nazwa przedmiotu	Wprowadzenie do BIM
Nazwa przedmiotu w języku angielskim	Introduction to BIM
Kod przedmiotu	WIL BUD oIS C39 19/20
Kategoria przedmiotu	Przedmioty kierunkowe
Liczba punktów ECTS	0.50
Semestry	5

2 Rodzaj zajęć, liczba godzin w planie studiów

Semestr	Wykład	Ćwiczenia audytoryjne	Laboratoria	Laboratoria komputerowe	Projekty	Seminarium
5	8	0	0	0	0	0

3 Cele przedmiotu

Cel 1 Cel przedmiotu 1 Familiarizing students with the concepts of the modern information technology methods and solutions for the construction industry and their role in changing paradigms of the design, analysis, construction and management of the built environment

Cel 2 Cel przedmiotu 2 Familiarize students with the latest BIM tools and workflows in the BIM-oriented project

delivery, information models of buildings, their creation during design phaze and versatile use in the life cycle of the object.

Cel 3 Cel przedmiotu 3 Familiarizing students with new collaborative BIM processes of the construction industry, a new sociology of work, new processes of ensuring information quality and the role of new technologies in the delivery of modern, sustainable, pro-ecological and pro-social building objects.

Cel 4 Cel przedmiotu 4 Familiarizing students with the capabilities of the BIM technology in information management, cost reduction and increasing the overall efficiency of the construction industry at the execution of construction works and operation of the assets.

Cel 5 Cel przedmiotu 5 Presentation of the role and importance of BIM technology and methodology in the context of other dynamic phenomena of the construction industry digitization: mobile technologies, reverse engineering with the use of modern 3D imaging/measuring tools, additive manufacturing, IoT, as well as augmented and virtual reality (AR/VR) techniques.

4 Wymagania wstępne w zakresie wiedzy, umiejętności i innych kompetencji

1 Wymaganie 1 A general knowledge of the construction projects, their design, construction and operation

2 Wymaganie 2 A general knowledge of CAD systems

3 Wymaganie 3 Some experience in actual designing and/or scheduling/estimating construction projects as well as in the IT area (data structures, database system) will be welcome

5 Efekty kształcenia

EK1 Wiedza Efekt kształcenia 1 Students know the basic concepts of BIM technology and methodology, see the fundamental differences between CAD and BIM technology, know what is structural and semantic information, what is an information model of a building / structure, are aware that BIM technology describes a building object as a database of semantic components, relationships and limitations which they are subject to and the processes they generate. Students are aware how BIM relate to other digital methods of modern construction, like reverse engineering technologies (3D laser scanning / 3D photogrammetry, georadar techniques, virtual reality technology (VR / AR).

EK2 Wiedza Efekt kształcenia 2 Students know that the information model data can be used extensively throughout the object's lifecycle, know new BIM tools and processes, are aware of the universality of the BIM data models and the possibility of using it for various analyses. Students distinguish BIM modeling from BIM information management, know the advantages of BIM in the design, scheduling, costing, construction and operation of building structures. They know the basics of integrated project delivery (IPD) and the role of BIM as a platform integrating the IPD processes. Students know native and open BIM formats and differences between them. They know the BIM context in the public procurement law.

EK3 Umiejętności Efekt kształcenia 3 Students know the BIM software ecosystem and are competent to choose right programs for given BIM worlkflows. They are able to select the right file formats for a planned information exchange

EK4 Umiejętności Efekt kształcenia 4 Student is able to do a rather simple costing/scheduling based on BIM models, can plan the BIM use in planning and execution of construction works

EK5 Kompetencje społeczne Efekt kształcenia 5 Student are aware that the BIM revolution is also of social kind, creates and/or redefines roles and responsibilities on the labor market, know that the new roles and functions related to BIM create opportunities for self development and vocational training. Students are aware of the new BIM teamwork and multi-discipline processes, are aware of the role of soft skills and openness to others, are aware of the growing importance of the information technology in the construction industry and importance of continuous learning. They are aware of the relationship between the BIM methodology and sustainable construction, green construction, lean construction.

EK6 Kompetencje społeczne Efekt kształcenia 6 Students can work in teams on team projects, share work and responsibility. They can search for information and critically evaluate information suitability, can form opinions and effectively communicate knowledge and enthusiasm for new technologies also with use of modern techniques like multimedia presentations.

6 Treści programowe

Wykład		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
W1	Treści programowe 1 The natuire and importance of information in construction industry. Traditional circulation of design information and the digital revolution. Why CAD technology did not solve the problems of digitalization of construction industry. What is structural and semantic information, what is the information model, what is the information model of the building / structure. BIM as a true digital revolution in the construction industry. IT foundations of BIM technology: parametric 3D modelers, intelligent BIM components, data semantics. BIM as a life cycle system. BIM and PLM, BIM in the context of lean and sustainable construction.	2
W2	Treści programowe 2 Digital twins: BIM models and the building objects and the "Build-it-twice" rule. The BIM model as the central database of building objects. Bew-Richards taxonomy of BIM maturity levels. BIM dimensions from 3D to 7D (and beyond). New BIM processes: concurrent work, inter-disciplinary cooperation, digital information exchange in the life cycle of a building, 3D information coordination and collision detection. The BIM tools ecosystem. The challenges of digitization and the new role of Digital Construction Engineer (DCE).	2
W3	Treści programowe 3 Building Information Modeling vs Building Information Management. Communication as one of BIM drivers. BIM-centric information management tools. IPD (Integrated Project Delivery). BIM-based documentiion for project outset. BIM and public procurement. BIM in scheduling and costing of construction projects.	2
W4	Treści programowe 4 Mobile devices. Drones/3D laser scanning as a tool for inventory and inspection of construction works. Virtual and Augmented reality. 3D printing of building objects. BIM technology for project managers and inspectors.	2

7 Narzędzia dydaktyczne

N1 Lectures

N2 Teamwork

N3 multimedia presentations

8 Obciążenie pracą studenta

Forma aktywności	Średnia liczba godzin na zrealizowanie aktywności
Godziny kontaktowe z nauczycielem akademickim, w tym:	
Godziny wynikające z planu studiów	8
Konsultacje przedmiotowe	2
Egzaminy i zaliczenia w sesji	0
Godziny bez udziału nauczyciela akademickiego wynikające z nakładu pracy studenta, w tym:	
Przygotowanie się do zajęć, w tym studiowanie zalecanej literatury	0
Opracowanie wyników	0
Przygotowanie raportu, projektu, prezentacji, dyskusji	6
Sumaryczna liczba godzin dla przedmiotu wynikająca z całego nakładu pracy studenta	**16**
Sumaryczna liczba punktów ECTS dla przedmiotu	0.50

9 Sposoby oceny

Ocena formująca

F1 test

Ocena podsumowująca

P1 teamwork

Warunki zaliczenia przedmiotu

W1 An arithmetic average of all the grades

Kryteria oceny

Efekt kształcenia 1	
Na ocenę 3.0	The student understands that BIM is a new and modern design technique, CAD successor. He can exchange the basic differences between these techniques.
Na ocenę 4.0	The student understands that BIM is a new technology not only for design, but for life cycle of a building object as well, providing a complete digital description building object and all its important aspects.

Na ocenę 5.0	The student understands how important and crucial are the fundamental concepts of BIM, how semantic data models allow to build a whole ecosystem of BIM software and processes around this very idea, how BIM helps to improve the quality construction information and along with other modern technologies helps to digitize the construction industry. Has awareness of the importance and role of BIM in these digitization processes. Student also understands that BIM education is also a tool for technological breakthrough .
Efekt kształcenia 2	
Na ocenę 3.0	Student is able to list the main BIM applications for designing, cost estimation / scheduling and irealization of construction works. He or she sees BIM simply as a new tool. Has the awareness though that the implementation of BIM in the construction industry brings many important changes.
Na ocenę 4.0	Student sees BIM in its many aspects: as an ecosystem of new tools but also in its variety of new extensive processes. Has the understanding that BIM revolution is not a simple evolutionary exchange of CAD tools with BIM tools but an owerwhelming process of digitization of the construction industry and its transformation towards new economic, environmental, social, energetic effectiveness and quality.
Na ocenę 5.0	Student has the awareness that BIM revolution is above all a breakthrough not in tools, but in semantically rich data models and new processes centralized around it. Is aware how these new paradigms bring new processes like 3D coordination and collision detection, centralized data and communication exchange/repository, how BIM helps to keep the information resources up-to-date and coherent, which allows to generate high quality construction documentation, perform various analyses and so on. Is aware of the potential of BIM technology for teamwork. Undestands the concepts of OpenBIM and open information exchange.
Efekt kształcenia 3	
Na ocenę 3.0	Student can list some exemplary BIM tools/programs, has the general understanding of their capabilities.
Na ocenę 4.0	Student is aware that mature BIM processes calls for a whole ecosystem of software tools and intensive and extensive information exchanges generate a need for preparing information exchange processes and protocols
Na ocenę 5.0	Student knows many different software packages available on the market and can sketch workflows them employ them in order to meet the requirements. Student is aware that information exchanges generate some information loss risks. Has undestanding of the OpenBIM and native BIM file formats and can list their advantages and disadvantages in information exchange scenarios.
Efekt kształcenia 4	
Na ocenę 3.0	Student can name at least one BIM software package for costing and scheduling and is aware of the differences between traditional, CAD based workflows and new BIM-based workflows
Na ocenę 4.0	Student can list many software packages for performing cost and schedule analysis and knows basic differences between them

Na ocenę 5.0	Student is aware of differences between different BIM packages for costing and scheduling. Can actually prepare a simple cost and/or schedule analysis for a given project.
Efekt kształcenia 5	
Na ocenę 3.0	Student is aware that BIM not merely a new technology/software tool, but a new methodology of work, that it demands new competences, creates new roles and professions and challenges the construction labour market. Is aware that BIM software support collaborative and concurrent workflows.
Na ocenę 4.0	Student is aware of consequences and impact digitization of construction information in BIM models has on the way projects are done. Is aware of opportunities for collaboration, also beyond his/her own profession, and that these are the new processes BIM enables that makes BIM so powerful and capable a technology. Students understands that semantically rich BIM models are outright source of information for a whole range of new analyses so it creates opportunities for new professions/qualifications and if within skillful hands, BIM gives the new professionals chance for a new level of quality and effectiveness in projects they work on.
Na ocenę 5.0	Student is aware that the BIM software ecosystem and the new BIM processes are intended primarily to increase the efficiency of the construction industry, and they also have potential for reaching new level of aesthetic, economic, social and environmental values in construction projects. He or she also understands that reaching these new these goals is possible mainly thanks to cooperation with all stakeholders, open information sharing and teamwork. Student has the awareness that BIM technology can help the construction industry to significantly reduce the environmental load and knows how to use it for this purpose.
Efekt kształcenia 6	
Na ocenę 3.0	Student can perform team tasks and work with the other students. Is cooperative and responsively works on the assigned tasks.
Na ocenę 4.0	Student is an active member of the team, brings creativeness and enthusiasm to the team and is engaged in team work/ group dynamics. Has good analytical skills, can evaluate information.
Na ocenę 5.0	Student conscientiously performs assigend tasks, is an active and creative member of the group. Openly shares information, has own ideas but is also open to the ideas other members bring to the group. Has analytical and synthetical capabilities.

10 Macierz realizacji przedmiotu

Efekt kształcenia	Odniesienie danego efektu do szczegółowych efektów zdefiniowanych dla programu	Cele przedmiotu	Treści programowe	Narzędzia dydaktyczne	Sposoby oceny
EK1	K_W11 K_W17	Cel 1 Cel 2 Cel 5	w1 w4	N1 N3	F1
EK2	K_W11 K_W15	Cel 4	w3	N1 N3	F1
EK3	K_U06 K_U17	Cel 1 Cel 2	w2 w3	N1 N3	F1
EK4	K_W11 K_W15	Cel 4	w3	N1 N3	F1
EK5	K_K01 K_K03 K_K06 K_K07	Cel 3 Cel 4	w2 w3	N1 N3	F1
EK6	K_K01 K_K03 K_K07 K_K09	Cel 3 Cel 4	w2	N1 N2 N3	F1 P1

11 Wykaz literatury

Literatura podstawowa

[1] Eastman Ch. et al. — *BIM handbook: a guide to building information modeling for owners, managers, designers, engineers, and contractors*, Hoboken,, 2008, Wiley

[2] Kasznia D., Magiera J., Wierzowiecki P. — *BIM w praktyce. Standardy, Wsrożenie. Case study*, Warszawa, 2018, PWN

[3] Tomana A. — *BIM. Innowacyjna technologia w budownictwie. Podstawy. Standardy. Narzędzia*, Miejscowość, 2015, A. Tomana

Literatura uzupełniająca

[1] Crotty R. — *The Impact of Building Information Modelling: Transforming Construction*, Abingdon,, 2012, SPON press

12 Informacje o nauczycielach akademickich

Osoba odpowiedzialna za kartę

dr inż. Jacek Magiera (kontakt: jacek.magiera@pk.edu.pl)

Osoby prowadzące przedmiot

1 dr inż. Jacek Magiera (kontakt: plmagier@cyf-kr.edu.pl)

2 dr hab. inz. Krzysztof Zima (kontakt: kzima@L3.pk.edu.pl)

13 Zatwierdzenie karty przedmiotu do realizacji

(miejscowość, data) (odpowiedzialny za przedmiot) (dziekan)

Przyjmuję do realizacji (data i podpisy osób prowadzących przedmiot)

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