Politechnika Krakowska im. Tadeusza Kościuszki

Karta przedmiotu

obowiązuje studentów rozpoczynających studia w roku akademickim 2024/2025

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	System Robot
Nazwa przedmiotu w języku angielskim	Robot computer code
Kod przedmiotu	WIL BUD oIS E1072 24/25
Kategoria przedmiotu	Przedmioty związane z dyplomem
Liczba punktów ECTS	4.00
Semestry	7

2 Rodzaj zajęć, liczba godzin w planie studiów

Semestr	Wykład	Ćwiczenia audytoryjne	Laboratoria	Laboratoria komputerowe	Projekty	Seminarium
7	0	0	0	30	0	0

3 Cele przedmiotu

Cel 1 Get student familiarized with an integrated computational environment oriented on Civil Engineering.

Cel 2 Show and explain selected aspects of practical numerical analysis (definition of geometry and loads) and their influence on quality of final results. Let students master dimensioning basic structural components.

Cel 3 Let students master basics of preparing documentation in an electronic form.

Cel 4 Develop a habitual critical approach to results obtained using computerized engineering support.

4 Wymagania wstępne w zakresie wiedzy, umiejętności i innych kompetencji

1 Basic knowledge on Finite Element Method, basics of reinforced concrete structure and metal structure design.

5 Efekty kształcenia

EK1 Wiedza Student is familiarized with Robot computer code.

EK2 Umiejętności Student defines geometry (shape and boundary conditions), defines loads and load combinations for simple engineering structure according to rules of Robot computer code.

EK3 Umiejętności Student performs engineering calculations for a linear and nonlinear statics problem using Robot computer code, including dimensioning of main structural components. Student prepares a presentation of obtained solution.

EK4 Umiejętności Student prepares basic documentation of a design solution obtained by himself.

EK5 Umiejętności Student performs a critical analysis of numerical results obtained by himself.

EK6 Umiejętności Student prepares, shows and defends a presentation on his design, including a critical analysis of obtained results.

6 Treści programowe

Laboratoria komputerowe		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
K1	Autodesk Student Community, course passing rules, general introduction to "Robot" structural code - preferences, case preferences.	2
K2	Exercise 1 - design for a 3D frame structure - definition of geometry and loads, copying, automatic load combinations, calculations, display of results.	2
K3	Exercise 2 - design for 3D frame structure - modification of geometry and loads, gamma angle, manual load combinations, verification and dimensioning of structural components.	2
K4	Exercise 3 - design for 3D frame structure - dimensioning of bar joints, climate loads, screen shots, documenting design.	2
K5	Exercise 4 - design for 3D frame structure - advanced bar characteristics, nonlinear analysis. First design exercise issued and discussed.	3
K6	Exercise 5 - design for reinforced concrete plate - definition of geometry and loads, reinforcement parameters, FEM mesh generation, display of results, reinforcement dimensioning, documenting design. Second design exercise issued and discussed.	5
K7	Exercise 6 - design for reinforced concrete structure - definition of geometry and loads, FEM mesh generaton, display of results, dimensioning reinforced concrete structural components (column, beam, plate, wall), documenting design.	3

Laboratoria komputerowe		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
K8	Exercise 7 - design for steel shell structure - definition of geometry and loads, geometrical limits, calculations, display of results.	2
K9	Exercise 8 - design for 3D steel truss structure subject to moving loads - definition of geometry and loads, prestressing, calculations, display of results.	2
K10	Exercise 9 - dynamic analysis of a 3d steel shell structure - definition of geometry and loads, modal analysis, dynamic analysis, calculations, display of results.	2
K11	Exercise 10 - dimensioning of a footing - soil calculator, soil database, geometry of a footing, surface area loads in the vicinity of designed footing.	2
K12	Exercise 11 - thermal loads - definition of loads on spherical shell, calculations, display of results in various coordinate systems.	2
K13	Presentation of student projects.	1

7 Narzędzia dydaktyczne

N1 Multimedia presentations

N2 Laboratory exercises

N3 Consultations

N4 Discussion

8 Obciążenie pracą studenta

Forma aktywności	Średnia liczba godzin na zrealizowanie aktywności
Godziny kontaktowe z nauczycielem akademickim, w tym:	
Godziny wynikające z planu studiów	30
Konsultacje przedmiotowe	15
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	15
Opracowanie wyników	25
Przygotowanie raportu, projektu, prezentacji, dyskusji	15
Sumaryczna liczba godzin dla przedmiotu wynikająca z całego nakładu pracy studenta	**100**
Sumaryczna liczba punktów ECTS dla przedmiotu	4.00

9 Sposoby oceny

Ocena formująca

F1 Individual design exercise

Ocena podsumowująca

P1 Mean of formative grades

Ocena aktywności bez udziału nauczyciela

B1 Indirectly via evaluation of of design exercises

Kryteria oceny

Efekt kształcenia 1	
Na ocenę 2.0	Student does not know basic capabilities of Robot computer code.
Na ocenę 3.0	Student knows basic capabilities of Robot computer code.
Na ocenę 3.5	As above.
Na ocenę 4.0	Student knows capabilities of Robot computer code.
Na ocenę 4.5	As above.

Na ocenę 5.0	Student knows extended capabilities of Robot computer code.
Efekt kształcenia 2	
Na ocenę 2.0	Student is incapable of executing the task described below.
Na ocenę 3.0	Student correctly defines geometry of a simple in plane (2D) and spatial (3D) structure consisting of bars and shells, loads and load combinations using Robot computer code.
Na ocenę 3.5	As above.
Na ocenę 4.0	Student correctly defines geometry of an in plane (2D) and spatial (3D) structure consisting of bars and shells, loads and load combinations using Robot computer code.
Na ocenę 4.5	As above.
Na ocenę 5.0	Student correctly and swiftly defines geometry of an in plane (2D) and spatial (3D) structure consisting of bars and shells, loads and load combinations using Robot computer code.
Efekt kształcenia 3	
Na ocenę 2.0	Student is incapable of executing the task described below.
Na ocenę 3.0	Student performs calculations (statics) of a simple structure defined by himself, prepares presentation of results in a graphical and tabular form. Student dimensions structural components according to PN/EN currently in force.
Na ocenę 3.5	As above.
Na ocenę 4.0	Student performs calculations (statics) of a structure defined by himself, prepares presentation of results in a graphical and tabular form. Student dimensions structural components according to PN/EN currently in force.
Na ocenę 4.5	As above.
Na ocenę 5.0	Student performs calculations (statics) of a complex structure defined by himself, prepares presentation of results in a graphical and tabular form. Student dimensions structural components according to PN/EN currently in force.
Efekt kształcenia 4	
Na ocenę 2.0	Student is incapable of executing the task described below.
Na ocenę 3.0	Student uses the screen shot system of Robot computer code to prepare the documentation of calculations performed (statics) and dimensioning of selected structural components (assumed loading schemes, load combinations, report on calculations (statics), graphs of all generalized sectional forces, dimensioning of bars and bar connections, dimensioning of plates and shells, shop drawings of steel and reinforced concrete structures, formwork plans).
Na ocenę 3.5	As above.

Na ocenę 4.0	As above.
Na ocenę 4.5	As above.
Na ocenę 5.0	As above.
Efekt kształcenia 5	
Na ocenę 2.0	Student is incapable of executing the task described below.
Na ocenę 3.0	Student is able to find basic errors in computer model of a structure (geometrical instability, multipart structure).
Na ocenę 3.5	As above.
Na ocenę 4.0	Student is able to find errors in computer model of a structure (geometrical instability, multipart structure).
Na ocenę 4.5	As above.
Na ocenę 5.0	Student is able to find compounded errors in computer model of a structure (geometrical instability, multipart structure).
Efekt kształcenia 6	
Na ocenę 2.0	Student is incapable of executing the task described below.
Na ocenę 3.0	Based on a documentation of his work in an electronic form, student prepares and shows a multimedia presentation. Student answers questions to this presentation and defends his work.
Na ocenę 3.5	As above.
Na ocenę 4.0	Based on a documentation of his work in an electronic form, student prepares and shows a multimedia presentation. Student competently answers questions to this presentation and defends his work.
Na ocenę 4.5	As above.
Na ocenę 5.0	Based on a documentation of his work in an electronic form, student prepares and shows a multimedia presentation. Student competently and swiftly answers questions to this presentation and defends his work.

10 Macierz realizacji przedmiotu

Efekt kształcenia	Odniesienie danego efektu do szczegółowych efektów zdefiniowanych dla programu	Cele przedmiotu	Treści programowe	Narzędzia dydaktyczne	Sposoby oceny
EK1		Cel 1	k2 k3	N1 N2 N3	F1 P1
EK2		Cel 2	k4 k5	N2 N3	F1 P1
EK3		Cel 2	k6 k7	N2 N3 N4	F1 P1
EK4		Cel 3	k4 k7	N2 N3 N4	F1 P1
EK5		Cel 4	k8 k9 k10 k11	N3 N4	F1 P1
EK6		Cel 4	k12	N1 N4	F1 P1

11 Wykaz literatury

Literatura podstawowa

[1] Autodesk Corp. — *Autodesk Robot Structural Analysis 2010. User manual.*, Boston, 2020, Autodesk

[2] Autodesk Corp. — *Autodesk Robot Structural Analysis Professional 2009. Training manual - metric version.*, Boston, 2020, AutoDesk

Literatura uzupełniająca

[1] Olgierd C. Zienkiewicz, Robert L. Taylor — *The Finite Element Method*, Oxford, 2000, Butterworth-Heinemann

[2] J. Fish, T. Belytschko — *A first course in Finite Elements*, New York, 2005, McGraw-Hill

[3] J. N. Reddy — *An Introduction to the Finite Element Method (engineering series).*, New York, 2005, McGraw-Hill

12 Informacje o nauczycielach akademickich

Osoba odpowiedzialna za kartę

dr inż. Michał Pazdanowski (kontakt: `michal.pazdanowski@pk.edu.pl`)

Osoby prowadzące przedmiot

1 dr inż. Michał Pazdanowski (kontakt: `michal@l5.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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