Politechnika Krakowska im. Tadeusza Kościuszki

Karta przedmiotu

obowiązuje studentów rozpoczynających studia w roku akademickim 2021/2022

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	Technologia betonu
Nazwa przedmiotu w języku angielskim	Technology of Concrete
Kod przedmiotu	WIL BUD oIS C23 21/22
Kategoria przedmiotu	Przedmioty kierunkowe
Liczba punktów ECTS	3.00
Semestry	3

2 Rodzaj zajęć, liczba godzin w planie studiów

Semestr	Wykład	Ćwiczenia audytoryjne	Laboratoria	Laboratoria komputerowe	Projekty	Seminarium
3	15	15	15	0	0	0

3 Cele przedmiotu

Cel 1 TO FAMILIARIZE STUDENTS WITH CONSTITUENT MATERIALS FOR ORDINARY CONCRETE, THEIR PROPERTIES, TEST METHODS AND REQUIREMENTS.

Cel 2 TO FAMILIARIZE STUDENTS WITH BASIC PHENOMENONS OCCURRING IN CEMENT PASTE.

Cel 3 TO FAMILIARIZE STUDENTS WITH RULES OF DESIGNING OF CONCRETE MIXTURE COMPOSITION AND MEASUREMENTS OF ITS BASIC PROPERTIES.

Cel 4 TO FAMILIARIZE STUDENTS WITH BASIC PROPERTIES OF HARDENED CONCRETE, METHODS OF THEIR TESTING AND GENERAL QUALITY CONTROL PRINCIPLES.

Cel 5 TO FAMILIARIZE STUDENTS WITH BASIC TECHNOLOGICAL PROCESSES AND THEIR INFLUENCE ON FINAL PROPERTIES OF CONCRETE IN A MEMBER OR A STRUCTURE

Cel 6 TO PREPARE STUDENTS FOR TEAM WORKING

Cel 7 TO PREPARE STUDENTS FOR RESEARCH

4 Wymagania wstępne w zakresie wiedzy, umiejętności i innych kompetencji

1 BASIC KNOWLEDGE ON CHEMISTRY AND PROPERTIES OF MINERAL BINDERS

2 BASIC KNOWLEDGE ON STRENGTH OF MATERIALS

5 Efekty kształcenia

EK1 Wiedza A STUDENT KNOWS BASIC GROUPS OF CONSTITUENTS MATERILAS OF ORDINARY CONCRETE AND THEIR GENERAL ROLE IN THE CONCRETE.

EK2 Wiedza A STUDENT KNOWS BASIC PROCESSES OCCURING IN CEMENT PASTE.

EK3 Wiedza A STUDENT KNOWS BASIC RELATIONSHIPS BETWEEN CONCRETE COMPOSITION AND PROPERTIES OF FRESH AND HARDENED CONCRETE.

EK4 Wiedza A STUDENT KNOWS BASIC PROPERTIES OF HARDENED CONCRETE

EK5 Wiedza A STUDENT KNOWS BASIC TECHNOLOGICAL PROCESSES AND CAN EXPLAIN THEIR INFLUENCE ON QUALITY OF HARDENED CONCRETE.

EK6 Umiejętności A STUDENT CAN DESIGN COMPOSITION OF ORDINARY CONCRETE OF ASSUMED PROPERTIES.

EK7 Umiejętności A STUDENT CAN CARRY OUT LABORATORY TESTS OF BASIC PROPERTIES OF CONCRETE CONSTITUENT MATERIALS, FRESH AND HARDENED CONCRETE.

EK8 Kompetencje społeczne A STUDENT CAN WORK INDIVIDUALLY AND COOPERATE IN A TEAM ON AN ASSIGNED TASK.

EK9 Kompetencje społeczne A STUDENT IS RESPONSIBLE FOR THE RELIABILITY OF THE ACHIEVED RESULTS OF HIS/HER WORK AND THEIR INTERPRETATION.

6 Treści programowe

Laboratoria		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
L1	Testing basic properties of cement. Making paste of standard consistence for determination of setting time. Making standard mortar and preparation of specimens for cement strength test. Testing cement flexural and compressive strength and determination of cement class.	2

Laboratoria		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
L2	Testing basic properties of aggregate: sieve analysis, determination of loose and compacted bulk densities, determination of tightness and voids content. Selection of optimal aggregate grading for concrete by a method of successive approximations.	2
L3	Making concrete mixture designed by a trial method. Testing its basic properties: density, consistence (by slump test, Vebe test, Degree of compatibility test and flow table test), air content by pressure method. Moulding specimens for strength tests.	2
L4	Approval of assumptions and correction of calculations of concrete composition for individually assigned subjects of a design project.	3
L5	Testing basic properties of hardened concrete: density, compressive strength, flexural strength, tensile splitting strength. Determination of compressive strength class of the concrete. Demonstration of stands for testing freeze/thaw resistance and waterpermeability of concrete.	2
L6	Non-destructive testing: presentation of basic methods of testing hardened concrete in a structure. Determination of rebound number with a sclerometer of N-type.	2
L7	Solving problems applying in design of concrete composition, prediction of hardened concrete properties and concrete strength classification.	2

Ćwiczenia audytoryjne		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
C1	Common cements. Types of cements, their application fields, classification, basic properties and their testing.	2
C2	Aggregates for concrete. Classification, types of tests, test methods for basic properties, methods of optimal aggregate selection for concrete.	2
C3	Concrete mixture. Basic properties and their test methods. Practical method of designing concrete composition.	2
C4	Chemical admixtures and mineral additives for concrete. Basic types, effects and fields of application.	2
C5	Designing concrete composition by analytical methods: of sand point, of covering of coarse aggregate particles with mortar, of overfilling voids of coarse aggregate particles with mortar.	3
C6	Testing properties of hardened concrete. Testing mechanical properties: compressive strength, tensile splitting strength, flexural strength. Rules for determination of concrete compressive strength class. Testing physical properties: density, water absorption, depth of penetration of water under pressure, freeze/thaw resistance.	2

Ćwiczenia audytoryjne		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
C7	Destructive, semi-destructive and non-destructive methods of testing concrete in an element or construction.	2

Wykład		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
W1	Introduction to ordinary concrete. Basic therms, components, definitions and classifications. Concrete application. Special types of concrete.	2
W2	Portland cement: production outline, oxide and mineralogical composition of cement clinker. General survey of common cements. Basic information on cement setting and hardening process. Cement paste and water/cement ratio. The role of cement paste in moddeling of basic concrete properties.	2
W3	Aggregate and its role in concrete. Classification, basic properties and requirements. Relationship between voids content, specific surface and cement paste demand.	2
W4	Water for concrete, its classification and role in concrete mixture. Consistence condition. Chemical admixtures for concrete and their general classification. Fresh concrete and its basic properties. Tightness condition.	2
W5	Hardened concrete: definition, general characteristic, role in structural members, structure, types of properties.	1
W6	Mechanical properties of hardened concrete: Compressive strength: classification, conformity criteria, formulas. The other mechanical properties:tensile strength; modulus of elasticity, creep. Factors affecting mechanical properties of concrete. Concrete deformability under load.	2
W7	Physical properties of hardened concrete: density, volume changes of unload concrete (thermal expansion and contraction, drying and autogenous shrinkage, swelling). Durability: deffinition, working life, types of detrimental actions, factors determining durability, exposure classes, requirements concerning concrete composition and properties.	2
W8	Basic technological processes (mixing, delivery, placing, compaction and curing) and their influence on quality of concrete in a member or a structure.	2

7 Narzędzia dydaktyczne

N1 Lectures

N2 Multimedia presentations

N3 Laboratory classes

N4 Work in groups

N5 Table tasks

N6 Consultations

8 Obciążenie pracą studenta

Forma aktywności	Średnia liczba godzin na zrealizowanie aktywności
Godziny kontaktowe z nauczycielem akademickim, w tym:	
Godziny wynikające z planu studiów	45
Konsultacje przedmiotowe	6
Egzaminy i zaliczenia w sesji	6
Godziny bez udziału nauczyciela akademickiego wynikające z nakładu pracy studenta, w tym:	
Przygotowanie się do zajęć, w tym studiowanie zalecanej literatury	12
Opracowanie wyników	9
Przygotowanie raportu, projektu, prezentacji, dyskusji	12
Sumaryczna liczba godzin dla przedmiotu wynikająca z całego nakładu pracy studenta	**90**
Sumaryczna liczba punktów ECTS dla przedmiotu	3.00

9 Sposoby oceny

To obtain a positive grade in the subject a student should achieve all learning effects specified for the subject, with at least the criteria for grade 3.0 being met.

Ocena formująca

F1 Written test on the material delivered in lectures

F2 Written test on the material delivered in tutorials and laboratories

F3 Oral defence of the individual project

Ocena podsumowująca

P1 Weighted average of forming grades ((F1 - 0,5; F2 - 0,2; F3 - 0,2)

Warunki zaliczenia przedmiotu

W1 Getting credits for all forms of classes.

W2 Participation in tutorials and laboratory classesies. One unjustified absence in each form of classes is accepted.

Kryteria oceny

Efekt kształcenia 1	
Na ocenę 3.0	A STUDENT CAN SPECIFY BASIC GROUPS OF CONSTITUENT MATERIALS FOR ORDINARY CONCRETE AND THEIR GENERAL ROLE IN THE CONCRETE.
Efekt kształcenia 2	
Na ocenę 3.0	A STUDENT CAN SPECIFIY BASIC PROCESSES OCCURING IN CEMENT PASTE.
Efekt kształcenia 3	
Na ocenę 3.0	A STUDENT KNOWS BASIC RELATIONSHIPS BETWEEN FRESH AND HARDENED CONCRETE PROPERTIES AND ITS COMPOSITION AND CAN EXPLAIN THEIR MEANING AND SIGNIFICANCE.
Efekt kształcenia 4	
Na ocenę 3.0	A STUDENT CAN SPECIFY BASIC PROPERTIES OF HARDENED CONCRETE AND DESCRIBE TESTING METHODS FOR SOME OF THEM.
Efekt kształcenia 5	
Na ocenę 3.0	A STUDENT CAN SPECIFY BASIC TECHNOLOGICAL PROCESSES AND EXPLAIN THEIR GENERAL INFLUENCE ON QUALITY OF HARDENED CONCRETE.
Efekt kształcenia 6	
Na ocenę 3.0	A STUDENT KNOWS GENERAL RULES OF DESIGNING COMPOSITION OF ORDINARY CONCRETE OF SPECIFIED PROPERTIES BY BOTH METHODS: PRACTICAL AND ANALYTICAL. NEVERTHELESS SHE/HE CAN NOT SPECIFY PARTICULAR DESIGNING STAGES IN METHODS OF BOTH TYPES.
Efekt kształcenia 7	
Na ocenę 3.0	A STUDENT CAN CARRY OUT LABORATORY TESTS OF SOME BASIC PROPERTIES OF CONCRETE CONTITUENT MATERIALS, FRESH AND HARDENED CONCRETE. NEVERTHELESS SHE/HE HAS PROBLEMS WITH INTERPRETATION OF OBTAINED RESULTS.
Efekt kształcenia 8	
Na ocenę 3.0	A STUDENT EXECUTES A PART OF TASK ASSSIGNED FOR A TEAM. NEVERTHELESS SHE/HE NEITHER CONSULTATE NOR VERIFICATE OBTAINED RESULTS WITH A TEAM.
Efekt kształcenia 9	
Na ocenę 3.0	A student correctly interprets the obtained results of tests and calculations and correctly classifies the cement class, concrete mix consistencE class and hardened concrete strength class.

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_W14	Cel 1	l1 l2 c1 c2 c4 w1 w2 w3 w4	N1 N2 N3 N4 N5 N6	F1 F2 P1
EK2	K_W14	Cel 2	l1 c1 w2	N1 N2 N3 N4 N5 N6	F1 F2 P1
EK3	K_W14	Cel 3 Cel 4	l3 l4 l5 l6 l7 c3 c5 c6 w4 w5 w6 w7	N1 N2 N3 N4 N5 N6	F1 F2 F3 P1
EK4	K_W14	Cel 4	l5 l6 l7 c6 c7 w6 w7	N1 N2 N3 N4 N5 N6	F1 F2 P1
EK5	K_W14	Cel 5	l3 c3 c6 w8	N1 N2 N3 N4 N5 N6	F1 F3 P1
EK6	K_U13 K_U20	Cel 3	l3 l4 l7 c3 c5	N1 N2 N3 N4 N5 N6	F1 F2 F3 P1
EK7	K_U13	Cel 1 Cel 3 Cel 4	l1 l2 l3 l5 l6 c1 c2 c3 c6 c7	N2 N3 N4	F2 P1
EK8	K_K01	Cel 6	l1 l2 l3 l4 l5 l6 l7	N3 N4 N5	F2 F3 P1
EK9	K_K02	Cel 6 Cel 7	l1 l2 l3 l4 l5 l6 l7	N3 N4 N5 N6	F2 F3 P1

11 Wykaz literatury

Literatura podstawowa

[1] Neville A.M. — *Properties of concrete*, Londyn, 2011, Longman

[2] Newman J., Choo B.S. — *Advanced Concrete Technology*, Elsevire, 2007, Elsevire

[3] Jamroży Z. — *Beton i jego technologie*, Kraków, 2005, PWN

[4] Śliwiński J. — *Beton zwykły - Projektowanie i podstawowe właściwości*, Kraków, 1999, Polski Cement

[5] Mehta K., Monteiro P. — *Concrete: Mictrostructure, Properties and Materials*, New York, 2013, McGraw Hill Education

Literatura uzupełniająca

[1] Brandt A.M. — *Cement-based composites*, Routledge, 2009, Routledge

[2] Kurdowski W. — *Cement and Concrete*, Miejscowość, 2014, Springer

Literatura dodatkowa

[1] Standards: EN 206; EN 196; EN 197; EN 12350; EN 12390; EN 13670; EN 12620; EN 13577; EN 934.

[2] Magazines and Journals: in English: Cement and Concrete Research; Cement and Concrete Composites; Materials and Structures; ACI Materials Journal; Concrete International; Magazine of Concrete Research, etc.in Polish: Cement-Wapno-Beton (also in English); Budownictwo-Technologie- Architektura; Przegląd Budowlany; Materiały Budowlane; Inżynieria i Budownictwo; Archiwum Inżynierii Lądowej (also in English).

[3] Conferences Proceedings

12 Informacje o nauczycielach akademickich

Osoba odpowiedzialna za kartę

dr hab. inż. prof. PK Lucyna Domagała (kontakt: ldomagala@pk.edu.pl)

Osoby prowadzące przedmiot

1 dr hab. inż. Lucyna Domagała (kontakt: ldomagala@pk.edu.pl)

2 dr inż. Maciej Urban (kontakt: maurban@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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