**Nazwa przedmiotu:**

Mineral Composites Technology

**Koordynator przedmiotu:**

dr hab. inż. P. Woyciechowski, prof. PW; dr inż. G. Adamczewski

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Civil Engineering

**Grupa przedmiotów:**

Obligatory

**Kod przedmiotu:**

1080-BU000-ISA-0617

**Semestr nominalny:**

7 / rok ak. 2021/2022

**Liczba punktów ECTS:**

3

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

Total 75 h = 3 ECTS: presence at lectures 10 hours,
presence in the laboratory 30 hours,
read the literature 10 hours,
preparation of reports from its own studies conducted on laboratory 15 hours,
exam preparation and presence on the exam 10 hours.

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

Total 45 h = 2 ECTS: presence at lectures 10 hours,
presence in the laboratory 30 hours, consultation 5 hours.

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

Total 40 h = 1,5 ECTS: presence in the laboratory 30 hours,
preparation of reports from its own studies conducted on laboratory 10 hours.

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład: | 15h |
| Ćwiczenia: | 0h |
| Laboratorium: | 30h |
| Projekt: | 0h |
| Lekcje komputerowe: | 0h |

**Wymagania wstępne:**

Knowledge of building materials in the scope of the program objects Building Materials 1 and 2.

**Limit liczby studentów:**

30

**Cel przedmiotu:**

Expanding knowledge about natural construction materials (adhesives, aggregates, concrete and its components). Effect of composite components of concrete and the concrete interaction usefulness in different conditions. Ability to choose the ingredients of concrete to concrete structures and implementing conditions
Acquiring knowledge of the special types of cement concrete with the mastery of practical skills to design, implement and study their basic properties and special.

**Treści kształcenia:**

Composites Mineral - classification and general characteristics. Hydraulic binders and air; cement, gypsum, lime - production, course setting and hardening. The hydration of cement - the effect of phase composition of cement, mineral additions role, pozzolanic reaction, the proportion of gypsum. Aggregates natural and artificial - characteristics conditioning the choice of operating conditions concrete. Criteria for the technological quality and performance concrete and concrete; selection of basic ingredients (cement, aggregates), additives and supplements and their role in the concrete. Microalloyed to betonu- types and mechanisms of action apply: microsilica, microspheres, powders reactive chemical additives new generation of polymer-based fiber reinforcement. Mechanisms of concrete corrosion. Products based on cement, gypsum, lime and concrete - concrete phones, sand-lime products, plaster products; technology, properties, applications.
Design, construction and laboratory testing of concrete with special requirements, including: - frost-proof, waterproof, heavy, light, high strength - concrete reinforcement distributed (steel, plastic, hybrid) - concrete high-(microalloying, reducers mixing water) - concrete with self-compacting mixtures (viscosity regulators, hiperplastyfikatory). Studies of the air content in the concrete mix, pozanormowe workability evaluation method, testing the susceptibility of the mixture to self-release of water (bleeding), evaluation of changes in operating characteristics of the mixture over time. Research concrete operational characteristics determine its durability (frost resistance, water resistance, abrasion) .Badania The tensile strength of concrete in complex states of stress (tensile cracking, impact resistance). Studies samozagęszczalności concrete mix (flowability, melt flow rate, the flow through the obstacles, the ability to samoodpowietrzenia, resistance to segregation). Control and conformity assessment of concrete.

**Metody oceny:**

Written and oral examination
Preparation and oral examination reports of the exercises, final test at the end of the semester.

**Egzamin:**

tak

**Literatura:**

[1] Czarnecki L. i zespół, Beton według normy PN-EN 206-1 – komentarz. Polski Cement 2004;
[2] Osiecka E. Materiały budowlane. Spoiwa mineralne. Kruszywa. Of. Wyd. PW 2005;
[3] Neville A. Właściwości betonu Polski Cement, Kraków 2002;
[4] Jamroży Z. Beton i jego właściwości Arkady 2002;
[5] Śliwiński J. Beton zwykły – projektowanie i podstawowe właściwości, Polski cement 1999.

**Witryna www przedmiotu:**

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**Uwagi:**

## Charakterystyki przedmiotowe

### Profil ogólnoakademicki - wiedza

**Charakterystyka W1:**

Is knowledgeable about the cements and additives for concrete, knows the rules for the selection of ingredients for concrete in order to ensure the sustainability of concrete in various operating environments.

Weryfikacja:

written and oral examination.

**Powiązane charakterystyki kierunkowe:** K1\_W13

**Powiązane charakterystyki obszarowe:** P6U\_W, I.P6S\_WG.o, III.P6S\_WG

**Charakterystyka W2:**

Has knowledge of the properties, design and technology, the following special varieties of concrete frostresistant, waterproof, heavy, light, high-strength concrete, fiber reinforced concrete, high performance concrete, self-compacting concrete.

Weryfikacja:

written and oral examination.

**Powiązane charakterystyki kierunkowe:** K1\_W13

**Powiązane charakterystyki obszarowe:** P6U\_W, I.P6S\_WG.o, III.P6S\_WG

### Profil ogólnoakademicki - umiejętności

**Charakterystyka U1:**

Is able to select the appropriate composition of the binder to the concrete with regard to sustainability, in light of the standard requirements.

Weryfikacja:

Checking the correct selection of the type of cement for the concrete according to the given specification.

**Powiązane charakterystyki kierunkowe:** K1\_U03, K1\_U21, K1\_U15, K1\_U12

**Powiązane charakterystyki obszarowe:** P6U\_U, I.P6S\_UW.o, III.P6S\_UW.o

**Charakterystyka U2:**

Knows how to design and test special variety of concrete and evaluate their compliance with the specifications, it can make the choice of technology to the specific conditions for implementation

Weryfikacja:

Evaluating the accuracy of the laboratory test report.

**Powiązane charakterystyki kierunkowe:** K1\_U15, K1\_U12, K1\_U03, K1\_U21

**Powiązane charakterystyki obszarowe:** I.P6S\_UW.o, III.P6S\_UW.o, P6U\_U

**Charakterystyka U3:**

Is able as a member of the research team to interpret the provisions of the specification, design, execute and explore the varieties of concrete; understand the role of sustainability concrete technology.

Weryfikacja:

Evaluation of laboratory workflow, verification of concrete environmental performance assessment.

**Powiązane charakterystyki kierunkowe:** K1\_U23

**Powiązane charakterystyki obszarowe:** P6U\_U, I.P6S\_UO

### Profil ogólnoakademicki - kompetencje społeczne

**Charakterystyka K1:**

Understand the economic and social sense to ensure sustainability of buildings made of concrete and its importance for sustainable development.

Weryfikacja:

Verify understanding of the relationship of durability and sustainability in concrete technology.

**Powiązane charakterystyki kierunkowe:** K1\_K05

**Powiązane charakterystyki obszarowe:** P6U\_K, I.P6S\_KO