

# POLITECHNIKA KRAKOWSKA IM. TADEUSZA KOŚCIUSZKI

## KARTA PRZEDMIOTU

obowiązuje studentów rozpoczynających studia w roku akademickim 2020/2021

Wydział Inżynierii Lądowej

Kierunek studiów: Budownictwo

Profil: Ogólnoakademicki

Forma studiów: stacjonarne

Kod kierunku: BUD

Stopień studiów: II

Specjalności: Building and Engineering Constructions (profile: Building Structures)

### 1 INFORMACJE O PRZEDMIOCIE

|                                         |                                     |
|-----------------------------------------|-------------------------------------|
| NAZWA PRZEDMIOTU                        | Technologia prefabrykacji betonowej |
| NAZWA PRZEDMIOTU<br>W JĘZYKU ANGIELSKIM | Technology of Prefabrication        |
| KOD PRZEDMIOTU                          | WIL BUD oIIS D6 20/21               |
| KATEGORIA PRZEDMIOTU                    | Specialty subjects                  |
| LICZBA PUNKTÓW ECTS                     | 2.00                                |
| SEMESTRY                                | 2                                   |

### 2 RODZAJ ZAJĘĆ, LICZBA GODZIN W PLANIE STUDIÓW

| SEMESTR | WYKŁAD | ĆWICZENIA<br>AUDYTORYJNE | LABORATORIA | LABORATORIA<br>KOMPUTERO-<br>WE | PROJEKTY | SEMINARIUM |
|---------|--------|--------------------------|-------------|---------------------------------|----------|------------|
| 2       | 0      | 10                       | 10          | 0                               | 10       | 0          |

### 3 CELE PRZEDMIOTU

**Cel 1** To familiarize students with possibilities and technologies of craftsman and industrialized prefabricated units assembly.

**Cel 2** To familiarize students with prefabricated units assortment (both of contemporary and historical systems).

**Cel 3** To familiarize students with chosen technologies of precast concrete systems production.

- Cel 4** To show future designers the possibilities given by prefabrication industry to replace typical in situ reinforced concrete structures and some steel structure types by precast concrete systems.
- Cel 5** To familiarize students with concrete types characteristic of prefabrication industry, and with designing and preparing concrete mix of chosen types.
- Cel 6** To familiarize students with EU conformity system of concrete products and to show examples of quality control of chosen precast concrete products.
- Cel 7** To familiarize students with chosen aspects of research program design and conduction on the example of composition design and quality control of concrete for precast industry

## 4 WYMAGANIA WSTĘPNE W ZAKRESIE WIEDZY, UMIEJĘTNOŚCI I INNYCH KOMPETENCJI

1 None

## 5 EFEKTY KSZTAŁCENIA

- EK1 Wiedza** Knowledge. Student knows main assumptions of quality control system and methods of testing quality of typical precast units.
- EK2 Wiedza** Knowledge. Student knows contemporary prefabrication assortment, chosen technologies of precast concrete systems, and chosen aspects concerning quality control of precast units.
- EK3 Wiedza** Knowledge. Student knows technologies used in contemporary prefabrication and their advantages and disadvantages.
- EK4 Umiejętności** Skills. Student can design exemplary production line in prefabrication plant and to design productivity on each work-stand.
- EK5 Umiejętności** Skills. Student can design work of assembly staff and to complete a set of means of production (here: machines and appliances) in a way enabling efficient organization of exemplary prefabricated unit production.
- EK6 Wiedza** Knowledge. Student knows basic and special types of concrete used in precast industry and their special features, advantages, disadvantages and usage.
- EK7 Umiejętności** Skills. Student can properly proceed with chosen concrete types used in prefabrication (some items of laboratory design).
- EK8 Umiejętności** Skills. Student can properly proceed with basic test of quality control of typical precast units.

## 6 TREŚCI PROGRAMOWE

| LABORATORIA |                                                                                                                                                                                                                   |                  |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| LP          | TEMATYKA ZAJĘĆ<br>OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH                                                                                                                                                            | LICZBA<br>GODZIN |
| <b>L1</b>   | Safety precautions in concrete laboratory. Introduction (concrete types used in prefabrication industry, their special features, advantages, disadvantages and usage). Chosen aspects of research program design. | 1                |
| <b>L2</b>   | Wet Vibrated Concrete                                                                                                                                                                                             | 1                |
| <b>L3</b>   | Concrete compaction methods (vibropressing, vibrating table, poker vibration).                                                                                                                                    | 1                |

| LABORATORIA |                                                                                      |                  |
|-------------|--------------------------------------------------------------------------------------|------------------|
| LP          | TEMATYKA ZAJĘĆ<br>OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH                               | LICZBA<br>GODZIN |
| <b>L4</b>   | Lightweight concrete (structural and of open structure ones).                        | 2                |
| <b>L5</b>   | Self-Compacting Concrete                                                             | 2                |
| <b>L6</b>   | Hardening acceleration methods (admixtures and steam curing at atmospheric pressure) | 1                |
| <b>L7</b>   | Quality control of precast units (test of dimensions and load capacity)              | 1                |
| <b>L8</b>   | Strength testing of produced concrete.                                               | 1                |

| PROJEKTY  |                                                                                                                                                            |                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| LP        | TEMATYKA ZAJĘĆ<br>OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH                                                                                                     | LICZBA<br>GODZIN |
| <b>P1</b> | Introduction. Common data for design. Description of technology and production line organization in precast plant. Design of production line productivity. | 1                |
| <b>P2</b> | Concrete compaction techniques.                                                                                                                            | 2                |
| <b>P3</b> | Formworks and forming of precast units.                                                                                                                    | 2                |
| <b>P4</b> | Strength acceleration techniques in precast plants.                                                                                                        | 2                |
| <b>P5</b> | Main assembly department (rules of fresh concrete and reinforcement production organization, methodology of refining processes of constituent materials).  | 2                |
| <b>P6</b> | Storage department (rules for storage yards design and for inner transport organization).                                                                  | 1                |

| ĆWICZENIA AUDYTORYJNE |                                                                                                                     |                  |
|-----------------------|---------------------------------------------------------------------------------------------------------------------|------------------|
| LP                    | TEMATYKA ZAJĘĆ<br>OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH                                                              | LICZBA<br>GODZIN |
| <b>C1</b>             | Introduction (basic terms and definitions, history of prefabrication, types of structures, units and technologies). | 1                |
| <b>C2</b>             | Prefabrication of large-size units wall structures and systems.                                                     | 1                |
| <b>C3</b>             | Prefabrication of large-size units floor systems.                                                                   | 1                |
| <b>C4</b>             | Prefabrication of large-size units skeleton structures and units.                                                   | 1                |
| <b>C5</b>             | Prefabrication of large-size units units and systems for road construction.                                         | 1                |

| ĆWICZENIA AUDYTORYJNE |                                                                                                                                                  |                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| LP                    | TEMATYKA ZAJĘĆ<br>OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH                                                                                           | LICZBA<br>GODZIN |
| <b>C6</b>             | Prefabrication of large-size units systems and units for infrastructure structures.                                                              | 1                |
| <b>C7</b>             | Prefabrication of small-size units vibropressing (technology and units).                                                                         | 1                |
| <b>C8</b>             | Prefabrication of small-size units AAC (technology and units).                                                                                   | 1                |
| <b>C9</b>             | Basics of quality control and conformity system in prefabrication and most typical testing methods in quality control of precast concrete units. | 2                |

## 7 NARZĘDZIA DYDAKTYCZNE

**N1** pokaz elementów in vivo

**N2** Auditory meetings

**N3** Consultations

**N4** Multimedia Presentations

**N5** Laboratory meetings

**N6** Discussion

## 8 OBCIĄŻENIE PRACĄ STUDENTA

| FORMA AKTYWNOŚCI                                                                                 | ŚREDNIA LICZBA GODZIN<br>NA ZREALIZOWANIE<br>AKTYWNOŚCI |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <b>Godziny kontaktowe z nauczycielem akademickim, w tym:</b>                                     |                                                         |
| Godziny wynikające z planu studiów                                                               | 30                                                      |
| Konsultacje przedmiotowe                                                                         | 2                                                       |
| Egzaminy i zaliczenia w sesji                                                                    | 3                                                       |
| <b>Godziny bez udziału nauczyciela akademickiego wynikające z nakładu pracy studenta, w tym:</b> |                                                         |
| Przygotowanie się do zajęć, w tym studiowanie zalecanej literatury                               | 10                                                      |
| Opracowanie wyników                                                                              | 2                                                       |
| Przygotowanie raportu, projektu, prezentacji, dyskusji                                           | 6                                                       |
| <b>SUMARYCZNA LICZBA GODZIN DLA PRZEDMIOTU WYNIKAJĄCA Z<br/>CAŁEGO NAKŁADU PRACY STUDENTA</b>    | <b>53</b>                                               |
| SUMARYCZNA LICZBA PUNKTÓW ECTS DLA PRZEDMIOTU                                                    | 2.00                                                    |

## 9 SPOSOBY OCENY

Two-part final test. 1-st part concern to 3.0 grade, the 2-nd part - to the higher grade. The test is divided into blocks. Each block consist of knowledge or skills described by one Education Effect ("EK" in Polish)

### OCENA FORMUJĄCA

**F1** Final test

**F2** Individual design exercise

**F3** Laboratory reports completion

### OCENA PODSUMOWUJĄCA

**P1** weighed average calculated from individual marks

### WARUNKI ZALICZENIA PRZEDMIOTU

**W1** weights for partial tests F1-F3:

**W2** laboratory report - mark passed/failed

**W3** Test for EK6-8: 20%

**W4** Test for EK1-3: 60%

**W5** Individual design exercise (EK4 and 5): 20%

### OCENA AKTYWNOŚCI BEZ UDZIAŁU NAUCZYCIELA

**B1** Design exercise

**B2** Final Test

### KRYTERIA OCENY

| EFEKT KSZTAŁCENIA 1 |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark                                                                                                                                                                                                                                                                                                                                                                              |
| NA OCENĘ 3.0        | Student knows basic testing methods of precast units possible to be realized in case of shortage of specialized equipment. Criterion of pass: 75% of proper answers.                                                                                                                                                                                                                                                            |
| NA OCENĘ 3.5        | See mark 3.0 plus assessment of knowing the following problems: 1) System of conformity of products for building industry in Poland. 2) Quality control system in precast plant. 3) Assessed parameters of precast units not included in requirements for mark 3.0. 4) Chosen methods of assessment of precast units parameters from p.3. Criterion of pass: 25% of proper answers (together with pass criterion for mark 3.0). |
| NA OCENĘ 4.0        | Criterion of pass: 45% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                       |
| NA OCENĘ 4.5        | Criterion of pass: 65% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                       |
| NA OCENĘ 5.0        | Criterion of pass: 85% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                       |

| EFEKT KSZTAŁCENIA 2 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| NA OCENĘ 3.0        | Student knows basic types of precast units and subdivision of these main assortment groups. Criterion of pass: 75% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NA OCENĘ 3.5        | See mark 3.0 plus assessment of knowledge of the following problems: 1) Advantages and disadvantages of described assortment groups of precast units. 2) Technology of production of assortment listed in p. 1. 3) Concrete types used in technologies listed in p. 2 and their characteristics. 4) Aspects of structure erection from chosen precast systems. 5) Aspects of quality control of chosen precast units types. Criterion of pass: 25% of proper answers (together with pass criterion for mark 3.0).                                          |
| NA OCENĘ 4.0        | Criterion of pass: 45% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NA OCENĘ 4.5        | Criterion of pass: 65% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NA OCENĘ 5.0        | Criterion of pass: 85% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| EFEKT KSZTAŁCENIA 3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| NA OCENĘ 3.0        | 1) Student knows basic organization schemes of typical precast plant, production line and methods of their organization. 2) Student knows production process for exemplary units being subject of his/her design topic. 3) Student knows and understands basic production methods used in prefabrication (storage of components for production, production of fresh concrete and reinforcement, forming processes, concrete compaction, acceleration of concrete strength development, storage of final product) Criterion of pass: 66% of proper answers. |
| NA OCENĘ 3.5        | See mark 3.0 plus assessment of knowledge of the following problems: 1) Basic technologies in prefabrication (i.e. used in more than one assortment group) 2) Main assembly line organization of basic technologies (e.g. included in p 1). Criterion of pass: 25% of proper answers (together with pass criterion for mark 3.0).                                                                                                                                                                                                                          |
| NA OCENĘ 4.0        | Criterion of pass: 45% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NA OCENĘ 4.5        | Criterion of pass: 65% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| NA OCENĘ 5.0        | Criterion of pass: 85% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| EFEKT KSZTAŁCENIA 4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| NA OCENĘ 2.0        | Student who did not design given production line properly or designed it, but not fulfilling criteria given below.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| NA OCENĘ 3.0        | Like mark 3.5 in case of one mistake more, or in case of short-term Deans prolongation (not more than 2 mistakes allowed in this case). Students, who do not come for consultation before dead-line (the end of semester) are not allowed to complete design in this way.                                                                                                                                                                                                                                                                                  |

|                     |                                                                                                                                                                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NA OCENĘ 3.5        | Mark obtained when 3 mistakes are found (in case of finishing the design process before dead-line for mark 5.0) or with 2 mistakes in term up to 1 week after the dead-line, or with 1 mistake in term 1-2 weeks after the dead-line, or with no mistakes in case of finishing the design after more than 2 weeks after dead-line. |
| NA OCENĘ 4.0        | Mark obtained when 2 mistakes are found (in case of finishing the design process before dead-line for mark 5.0) or with 1 mistake in term up to 1 week after the dead-line, or without mistakes in term 1-2 weeks after the dead-line.                                                                                             |
| NA OCENĘ 4.5        | Mark obtained when 1 mistake is found (in case of finishing the design process before dead-line for mark 5.0) or without mistakes in term not longer than 1 week after dead-line.                                                                                                                                                  |
| NA OCENĘ 5.0        | Base mark in case of proper design (i.e. without mistakes) which is finished before dead-line (i.e. end of semester). The number of consultations of each design part is limited to 2; after the dead-line only one consultation term is possible.                                                                                 |
| EFEKT KSZTAŁCENIA 5 |                                                                                                                                                                                                                                                                                                                                    |
| NA OCENĘ 2.0        | Student who did not design given production line properly or designed it, but not fulfilling criteria given below.                                                                                                                                                                                                                 |
| NA OCENĘ 3.0        | Like mark 3.5 in case of one mistake more, or in case of short-term Deans prolongation (not more than 2 mistakes allowed in this case). Students, who do not come for consultation before dead-line (the end of semester) are not allowed to complete design in this way.                                                          |
| NA OCENĘ 3.5        | Mark obtained when 3 mistakes are found (in case of finishing the design process before dead-line for mark 5.0) or with 2 mistakes in term up to 1 week after the dead-line, or with 1 mistake in term 1-2 weeks after the dead-line, or with no mistakes in case of finishing the design after more than 2 weeks after dead-line. |
| NA OCENĘ 4.0        | Mark obtained when 2 mistakes are found (in case of finishing the design process before dead-line for mark 5.0) or with 1 mistake in term up to 1 week after the dead-line, or without mistakes in term 1-2 weeks after the dead-line.                                                                                             |
| NA OCENĘ 4.5        | Mark obtained when 1 mistake is found (in case of finishing the design process before dead-line for mark 5.0) or without mistakes in term not longer than 1 week after dead-line.                                                                                                                                                  |
| NA OCENĘ 5.0        | Base mark in case of proper design (i.e. without mistakes) which is finished before dead-line (i.e. end of semester). The number of consultations of each design part is limited to 2; after the dead-line only one consultation term is possible.                                                                                 |
| EFEKT KSZTAŁCENIA 6 |                                                                                                                                                                                                                                                                                                                                    |
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark.                                                                                                                                                                                                                                                                                |
| NA OCENĘ 3.0        | Student knows basic concrete types used in prefabrication and their exemplary application.                                                                                                                                                                                                                                         |
| NA OCENĘ 3.5        | As for mark 3.0 plus knows basic characteristics of concrete types. Criterion of pass: 25% of proper answers.                                                                                                                                                                                                                      |
| NA OCENĘ 4.0        | Criterion of pass: 45% of proper answers.                                                                                                                                                                                                                                                                                          |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NA OCENĘ 4.5        | Criterion of pass: 65% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 5.0        | Criterion of pass: 85% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| EFEKT KSZTAŁCENIA 7 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NA OCENĘ 3.0        | The choice from topics listed below: 1) Student knows and is capable to shortly describe compaction processes for concretes produced in the laboratory meetings. 2) Student knows and is capable to shortly describe quality control tests held in the laboratory meetings. 3) Student can comprehensively describe processes of concrete hardening acceleration by methods shown in the laboratory meetings. 4) Student can comprehensively describe processes of concrete compaction methods shown in the laboratory meetings. 5) Student knows specific tips needed for proper design of concrete types known from the laboratory meetings. Criterion of pass: 50% of proper answers. |
| NA OCENĘ 3.5        | Criterion of pass: 60% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 4.0        | Criterion of pass: 70% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 4.5        | Criterion of pass: 80% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 5.0        | Criterion of pass: 90% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| EFEKT KSZTAŁCENIA 8 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| NA OCENĘ 2.0        | Student not fulfilling criteria given for 3.0 mark.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| NA OCENĘ 3.0        | Student knows methods of conducting of basic quality assessment methods of precast concrete units (i.e. methods applying only simple equipment and therefore possible to conduct on building site). Criterion of pass: 75% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| NA OCENĘ 3.5        | See mark 3.0 plus assessment of knowledge of the following problems: 1) System of allowance for selling products for building industry in the UE and in Poland. 2) The structure of quality control (QC) assessment in prefabrication plant 3) The knowledge about typical methods of QC not listed above (i.e. in 3.0 mark criterion) and the chosen methods of their assessment. Criterion of pass: 25% of proper answers (together with pass criterion for mark 3.0).                                                                                                                                                                                                                 |
| NA OCENĘ 4.0        | Criterion of pass: 45% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 4.5        | Criterion of pass: 65% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| NA OCENĘ 5.0        | Criterion of pass: 85% of proper answers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## 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_W10 K_U11<br>K_U12 K_K06                                                     | Cel 6                               | 17 18 c2 c3 c4 c5<br>c6 c7 c8 c9                                     | N1 N4 N5 N6           | F2 F3 P1      |
| EK2               | K_W05 K_W07<br>K_W14 K_U02<br>K_U11 K_K05<br>K_K06                             | Cel 1 Cel 2<br>Cel 3 Cel 4<br>Cel 5 | c1 c2 c3 c4 c5 c6<br>c7 c8 c9                                        | N1 N4 N6              | F1 F3 P1      |
| EK3               | K_W03 K_W07<br>K_K03 K_K04<br>K_K06                                            | Cel 1 Cel 4<br>Cel 5                | 11 13 14 15 16 18<br>p1 p2 p3 p4 p5<br>p6 c1 c2 c3 c4 c5<br>c6 c7 c8 | N2 N4 N5 N6           | F1 F2 F3 P1   |
| EK4               | K_W05 K_W07<br>K_U10 K_K01                                                     | Cel 1 Cel 5                         | 11 12 15 p1 p2 p3<br>p4 p5 p6 c1 c2 c3                               | N2 N3 N4 N5           | F1 F2 F3 P1   |
| EK5               | K_W05 K_W07<br>K_U10 K_K01                                                     | Cel 1                               | p1 p6 c1                                                             | N2 N3 N4 N6           | F1 P1         |
| EK6               | K_W01 K_W05<br>K_W07 K_W14<br>K_U11 K_K04                                      | Cel 5                               | 11 12 14 15 17 18 c2<br>c3 c4 c5 c6 c8 c9                            | N4 N5                 | F2 F3 P1      |
| EK7               | K_W07 K_W14<br>K_U11 K_U12<br>K_U18 K_K02<br>K_K06                             | Cel 5 Cel 6<br>Cel 7                | 11 12 13 14 15 16 17<br>p3 p4 c9                                     | N2 N3 N4 N5 N6        | F1 F2 F3 P1   |
| EK8               | K_W10 K_W14<br>K_U11 K_U12<br>K_U18 K_K02<br>K_K06                             | Cel 6 Cel 7                         | 17 c9                                                                | N1 N5 N6              | F2 F3 P1      |

## 11 WYKAZ LITERATURY

### LITERATURA PODSTAWOWA

- [1] | Neville A.M — *Properties of Concrete*, London, 1997, Longman
- [2] | Urban M. — *Technology of Prefabrication*, Kraków, 0, (platforma e-nauczania PK)

### LITERATURA UZUPEŁNIAJĄCA

- [1] | Czasopismo — *Concrete Plant International*, -, 0, admedia GmbH
- [2] | praca zbiorowa — *Si. Symp. Prefabrication in Europe*, Kraków, 2007, PK

[3 ] - — *EN13369*, -, 0, PKN

## LITERATURA DODATKOWA

[1 ] strony internetowe i katalogi wytwórców sprzętu i elementów prefabrykowanych

[2 ] XXV WPPK Szczyrk 2010

## 12 INFORMACJE O NAUCZYCIELACH AKADEMICKICH

### OSOBA ODPOWIEDZIALNA ZA KARTĘ

dr inż. Maciej Urban (kontakt: [maciej.urban@pk.edu.pl](mailto:maciej.urban@pk.edu.pl))

### OSOBY PROWADZĄCE PRZEDMIOT

1 dr inż. Maciej Urban (kontakt: [maurban@pk.edu.pl](mailto:maurban@pk.edu.pl))

2 dr hab., prof PK Lucyna Domagała (kontakt: [ldomagala@pk.edu.pl](mailto:ldomagala@pk.edu.pl))

3 mgr inż. Katarzyna Mróz (kontakt: [kmroz@pk.edu.pl](mailto:kmroz@pk.edu.pl))

## 13 ZATWIERDZENIE KARTY PRZEDMIOTU DO REALIZACJI

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(miejscowość, data)

(odpowiedzialny za przedmiot)

(dziekan)

PRZYJMUJĘ DO REALIZACJI (data i podpisy osób prowadzących przedmiot)

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.....  
.....