

# POLITECHNIKA KRAKOWSKA IM. TADEUSZA KOŚCIUSZKI

## KARTA PRZEDMIOTU

obowiązuje studentów rozpoczynających studia w roku akademickim 2018/2019

Wydział Inżynierii Środowiska

Kierunek studiów: Inżynieria środowiska

Profil: Ogólnoakademicki

Forma studiów: stacjonarne

Kod kierunku: IŚ2

Stopień studiów: II

Specjalności: Environmental and land engineering sem. letni 2019

### 1 INFORMACJE O PRZEDMIOCIE

NAZWA PRZEDMIOTU	Applied hydraulics
NAZWA PRZEDMIOTU W JĘZYKU ANGIELSKIM	Applied Hydraulics II
KOD PRZEDMIOTU	WIŚ IŚ2 oIIS C4 18/19
KATEGORIA PRZEDMIOTU	Przedmioty kierunkowe
LICZBA PUNKTÓW ECTS	5.00
SEMESTRY	1

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

SEMESTR	WYKŁAD	ĆWICZENIA	LABORATORIUM	LABORATORIUM KOMPUTERO- WE	PROJEKT	SEMINARIUM
1	15	20	15	0	0	0

### 3 CELE PRZEDMIOTU

**Cel 1** The acquisition of theoretical and practical knowledge in the field of calculation of flow parameters in open channels with particular reference to the transient flow on the example of the hydraulic jump and depression curve effect.

**Cel 2** Learning of calculation methods for hydraulic design of: spillways and gated weirs, road culverts, bridges as well as stilling basins and energy dissipation devices

**Cel 3** Acquiring the ability to carry out computer simulation of flow conditions prevailing above and below the hydraulic structures such as spillways and road culverts.

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

- 1 Basic knowledge in the field of fluid mechanics.
- 2 Basic skills of computer modeling of flow in open channels.

#### 5 EFEKTY KSZTAŁCENIA

**EK1 Wiedza** Getting to know the mathematical description and physical interpretation of the effects of flow through the damming construction.

**EK3 Umiejętności** Getting the skill to use engineering calculation methods for hydraulic design of spillways, culverts and bridges.

**EK4 Umiejętności** Gaining the ability to apply engineering calculation methods for hydraulic design of the stilling basins and energy dissipators.

**EK5 Umiejętności** Gaining the ability to apply computer modelling of flow through the hydraulic structures such as spillways, culverts and bridges

#### 6 TREŚCI PROGRAMOWE

LABORATORIUM		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
<b>L1</b>	Experimental determination of the rating curve for ogee shaped weir	2
<b>L2</b>	Experimental determination of the rating curve for broad crested weir and its submergence conditions	3
<b>L3</b>	Sluice gate outflow - measurement of conjugated depths and hydraulic jump space and flow characteristics	4
<b>L4</b>	Pipe flow- experimental determination of friction and local energy head loss (comparison with theoretical loss coefficients value magnitudes)	3
<b>L5</b>	Water hammer effect in pipe- pressure wave experimental determination and comparison with theoretical calculation of celerity and pressure amplitude	3

WYKŁAD		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
<b>W1</b>	Supplementing information regarding the mathematical description of the transient flow (such as and hydraulic jump), flow classification according to the Froud number in connection with the hydraulic structures	2

WYKŁAD		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
<b>W2</b>	General characteristics of spillways used on damming constructions and specification of requirements for their capacity	2
<b>W3</b>	Presentation of the calculation procedures for the capacity of various types of weirs shape (ogee, broad crested, shaft, thin-walled and others ) for given operating conditions of damming structures	3
<b>W4</b>	Presentation of hydraulic calculations of flow conditions prevailing on spillways and their application for design purposes	2
<b>W5</b>	Presentation of capacity and dimensioning calculations for road culverts and gated bottom spillways installed on small dams. Mathematical description of water hammer effect	3
<b>W6</b>	The theoretical basics of the stilling basin and energy dissipation devices designing	3

ĆWICZENIA		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
<b>C1</b>	Calculation of dimensions and weirs' parameters for design flow conditions and hydraulic modeling of weirs operating (ogee shapes without level control, gated ogee and broad crested weirs regulated by sluice or segment closing) based on the Hec-Ras software.	5
<b>C2</b>	Numerical simulation of optimal regulation of controlled spillways discharges on a example of a cascade of small objects that perform functions of small power plant and analysis of its effectiveness.	7
<b>C3</b>	Calculation of dimensions and parameters of road culverts based on the design flow discharge and simulation of their impact on flow conditions by using the Hec Ras program	5
<b>C4</b>	Hydraulic design of a stilling basins - calculations based on the mathematical formulas	3

## 7 NARZĘDZIA DYDAKTYCZNE

**N1** Lecture presentation slides and the book

**N2** Exercise materials- diagrams, coefficients tables, geometric data of an exemplary river channel

**N3** Computer software- Hec-Ras 4.1

## 8 OBCIĄŻENIE PRACĄ STUDENTA

FORMA AKTYWNOŚCI	ŚREDNIA LICZBA GODZIN NA ZREALIZOWANIE AKTYWNOŚCI
<b>Godziny kontaktowe z nauczycielem akademickim, w tym:</b>	
Godziny wynikające z planu studiów	50
Egzaminy i zaliczenia w sesji	2
<b>Godziny bez udziału nauczyciela akademickiego wynikające z nakładu pracy studenta</b>	15
<b>SUMARYCZNA LICZBA GODZIN DLA PRZEDMIOTU WYNIKAJĄCA Z CAŁEGO NAKŁADU PRACY STUDENTA</b>	<b>67</b>
SUMARYCZNA LICZBA PUNKTÓW ECTS DLA PRZEDMIOTU	5

## 9 SPOSOBY OCENY

Ocena poprawności wykonania projektu, kreatywności i świadomości realizowanych zagadnień

### OCENA FORMUJĄCA

**F1** Evaluation of the realization of individual projects

### OCENA PODSUMOWUJĄCA

**P1** Examination of the students on the basis of a conversation about the projects carried out

### WARUNKI ZALICZENIA PRZEDMIOTU

**W1** Attendance in class

**W2** Delivering completed projects on time

**W3** Providing the correct answer to questions about the exercises

### OCENA AKTYWNOŚCI BEZ UDZIAŁU NAUCZYCIELA

**B1** Providing the correct answer to questions about a basic theory concepts

### KRYTERIA OCENY

EFEKT KSZTAŁCENIA 1	
NA OCENĘ 2.0	Student does not have sufficient knowledge in the required scope.
NA OCENĘ 3.0	Student has sufficient knowledge in the required scope. Obtained between 51% and 60% of points for correct answers.

NA OCENĘ 3.5	Student has sufficient knowledge in the required scope. Obtained between 61% and 70% of points for correct answers.
NA OCENĘ 4.0	Student has sufficient knowledge in the required scope. Obtained between 71% and 80% of points for correct answers.
NA OCENĘ 4.5	Student has sufficient knowledge in the required scope. Obtained between 81% and 90% of points for correct answers.
NA OCENĘ 5.0	Student has sufficient knowledge in the required scope. Obtained between 91% and 100% of points for correct answers.
EFEKT KSZTAŁCENIA 3	
NA OCENĘ 2.0	Student doesn't have sufficient knowledge in the required scope
NA OCENĘ 3.0	Student has sufficient knowledge in the required scope. Obtained between 51% and 60% of points for correct answers.
NA OCENĘ 3.5	Student has sufficient knowledge in the required scope. Obtained between 61% and 70% of points for correct answers.
NA OCENĘ 4.0	Student has sufficient knowledge in the required scope. Obtained between 71% and 80% of points for correct answers.
NA OCENĘ 4.5	Student has sufficient knowledge in the required scope. Obtained between 81% and 90% of points for correct answers.
NA OCENĘ 5.0	Student has sufficient knowledge in the required scope. Obtained between 91% and 100% of points for correct answers.
EFEKT KSZTAŁCENIA 4	
NA OCENĘ 2.0	Student doesn't have sufficient knowledge in the required scope.
NA OCENĘ 3.0	Student has sufficient knowledge in the required scope. Obtained between 51% and 60% of points for correct answers.
NA OCENĘ 3.5	Student has sufficient knowledge in the required scope. Obtained between 61% and 70% of points for correct answers.
NA OCENĘ 4.0	Student has sufficient knowledge in the required scope. Obtained between 71% and 80% of points for correct answers.
NA OCENĘ 4.5	Student has sufficient knowledge in the required scope. Obtained between 81% and 90% of points for correct answers.
NA OCENĘ 5.0	Student has sufficient knowledge in the required scope. Obtained between 91% and 100% of points for correct answers.
EFEKT KSZTAŁCENIA 5	
NA OCENĘ 2.0	Student does not have sufficient knowledge in the required scope.
NA OCENĘ 3.0	Student has sufficient knowledge in the required scope. Obtained between 51% and 60% of points for correct answers.

NA OCENĘ 3.5	Student has sufficient knowledge in the required scope. Obtained between 61% and 70% of points for correct answers.
NA OCENĘ 4.0	Student has sufficient knowledge in the required scope. Obtained between 71% and 80% of points for correct answers.
NA OCENĘ 4.5	Student has sufficient knowledge in the required scope. Obtained between 81% and 90% of points for correct answers.
NA OCENĘ 5.0	Student has sufficient knowledge in the required scope. Obtained between 91% and 100% of points for correct 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_W06	Cel 1 Cel 2	L1 L2 W1 W2 W3 W4 W5 W6	N1 N2 N3	F1 P1
EK3	K_U08	Cel 3	L1 L2 L3 W2 W3 W4	N2 N3	F1 P1
EK4	K_U08	Cel 2 Cel 3	W3 W4 W5 W6	N2 N3	F1 P1
EK5	K_U03 K_U08	Cel 1 Cel 2 Cel 3	W2 W3 W4 W5 C2 C3	N1 N2 N3	F1 P1

## 11 WYKAZ LITERATURY

### LITERATURA PODSTAWOWA

- [1 ] **Martin Marriott** — *Civil Engineering Hydraulics*, London, 2016, Wiley-Blackwell
- [2 ] **D. Vischer; Willi H. Hager; D. Cischer** — *Dam Hydraulics*, Zurich, 1998, Wiley
- [3 ] **Willi H. Hager** — *Energy Dissipators and Hydraulic Jump*, Netherlands, 1992, Kluwer Academic Publishers

### LITERATURA UZUPEŁNIAJĄCA

- [1 ] **John G. Hendrickson Jr.** — *Hydraulics of Culverts*, Miejscość, 1964, American Concrete Pipe Association;

**LITERATURA DODATKOWA**

[1 ] Szymkiewicz, Romuald — *Numerical Modeling in Open Channel Hydraulics*, Netherlands, 2010, Springer

**12 INFORMACJE O NAUCZYCIELACH AKADEMICKICH****OSOBA ODPOWIEDZIALNA ZA KARTĘ**

dr inż Tomasz Siuta (kontakt: tomasz.siuta@iigw.pk.edu.pl)

**OSOBY PROWADZĄCE PRZEDMIOT**

1 dr inż Tomasz Siuta (kontakt: tomasz.siuta@iigw.pk.edu.pl)

**13 ZATWIERDZENIE KARTY PRZEDMIOTU DO REALIZACJI**

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(miejsowość, data)

(odpowiedzialny za przedmiot)

(dziekan)

**PRZYJMUJĘ DO REALIZACJI** (data i podpisy osób prowadzących przedmiot)

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