Politechnika Krakowska
im. Tadeusza Kościuszki

Karta przedmiotu

obowiązuje studentów rozpoczynających studia w roku akademickim 2020/2021

Wydział Inżynierii Środowiska i Energetyki

Kierunek studiów: Inżynieria Środowiska | Profil: Ogólnoakademicki

Forma sudiów: stacjonarne | Kod kierunku: IŚ2

Stopień studiów: II

Specjalności: Environmental and land engineering

1 Informacje o przedmiocie

Nazwa przedmiotu	Water supply and sewerage
Nazwa przedmiotu w języku angielskim	Water supply and sewerage
Kod przedmiotu	WIŚIE IŚ2 oIIS C9 20/21
Kategoria przedmiotu	Przedmioty kierunkowe
Liczba punktów ECTS	6.00
Semestry	2

2 Rodzaj zajęć, liczba godzin w planie studiów

Semestr	Wykład	Cwiczenia	Laboratoria	Laboratoria komputerowe	Projekt	Seminarium
2	30	0	0	10	20	0

3 Cele przedmiotu

Cel 1 students get knowledge on selected issues in water supply

Cel 2 students get knowledge on selected issues in sewage disposal systems

Cel 3 The ability to use the computer software programs to solve selected problems in drain and water supply systems

4 Wymagania wstępne w zakresie wiedzy, umiejętności i innych kompetencji

1 basics of hydraulic

2 basics of material science

5 Efekty kształcenia

EK1 Wiedza knowledge on water supply systems operation

EK2 Umiejętności teamwork skills

EK3 Wiedza knowledge on sewage disposal systems operation

EK4 Wiedza knowledge on design of water distribution systems and water puimping station

6 Treści programowe

Laboratoria komputerowe		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
K1	Mathemtical modeling of green infrastructure work	6
K2	Mathematical modeling of the rainwater tank operation	4

Wykład		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
W1	Selected items of information from fluid mechanics applied to calculations of friction to flow through pipes and porous media, such as sand groundwater intakes and depth filtration media. Darcy Weisbach equation and the Moody chart, Hazen Williams equation, Venturi equation, local frictions to flow. Consequences of the character of flow to the constructions of water treatment units.	2
W2	Materials applied for pipelines constructions in water supply and sewerage systems, mechanical properties of different materials, behaviour of stiff and viscous elastic materials, the importance of sand pipe surrounding compacting on the deformation of viscous elastic pipes, selection of materials in different circumstances, rust properties after ductile iron and steel, annealing process, pipe connections, socket blocked pipes connections for small and high pressures	2
W3	Electrochemical corrosion of metals in water, soil corrosion properties, evaluation of water corrosive properties, corrosion mechanisms, metals electrochemical series, protection of ductile iron pipes by inside cement mortar lining, zinc or zinc aluminum external coatings, cathodic protection, calcium carbonate equilibrium in natural waters, calcium carbonate equilibrium in water mixtures in systems closed to the atmosphere, reasons of applications in the U.S.A. softening as a water treatment process, shortcoming of this process.	2

Wykład		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
W4	Hydrogen sulfide corrosion of concrete wastewater sewers, mechanisms of corrosion , explonation why the rate of sulfur reduction in wastewater pressure mains usually does not depend on concentration of sulpfates in wastewater, impact of wastewater pH on the ratio of H2S/HS-, examples of severe corrosion cases, preventing corrosion methods.	2
W5	Predicting flow rates of storm water for different purposes, such as : draining of roofs, designing of small sewers, predicting cross sections of large sewers, storm water treatment. Minimal slopes of gravitational sewers, shear stresses along the wetted perimeter, selfcleansing velocity, critical velocity, classification of sewer sediments according to Crabtree, depth of flow and sediment transportation ability, bacterial content of wastewater, changes of wastewater quality during a day, eroding of sediments and transportation of contaminants to combined sewerage overflows.	2
W6	Monitoring of sewerage stationary and non stationary methods. Simply and inexpensive primary measurements. Californian pipes and the trajectory of free pipe outflow. Ultrasound creation, wave speed depending on media density and Young's modulus. The role of air temperature and humidity in forming ultrasound wave speed. Ultrasounds flow measurements for clean water versus wastewaters, dead zone in velocity measurements by ultrasounds, measuring of time intervals by different methods, three families of ultrasound flow velocity devices. Venturi, Palmer Bowlus, and Parshall flumes, two different approaches to flow measurements by flumes, accuracy of measurements by flumes in contrast with the risk of false measurements. Electromagnetic measurements of flow. Integral floats and other channel flow measurements.	2
W7	Water temperature impact on: the capacity of infiltration groundwater intakes, coagulation and flocculation, detention times in sedimentation tanks, rapid water filtration, fluidization of filter media and filters backwashing, effectiveness of water disinfection, head loss of flow through pipes. Character of flow and the concept of lamella clarifiers. Porous media segregation during backwashing, purposes of applying multimedia filters, reasons for poor first filtrate quality, transportation mechanisms in depth water filtration and the minimum transportation efficiency.	2
W8	trenchless water and sewer lines renovation technologies	2
W9	trench and trenchless constructions of water pipes and sewers	2
W10	The influence of pipe material on drinking water quality	2
W11	Structural design of buried pipelines	2
W12	Water and sewage pumping stations	2
W13	Water and sewage tanks	2
W14	road drainage design	2
W15	calculation methods of rain intensity for stormawater system design	2

Projekt		
Lp	Tematyka zajęć Opis szczegółowy bloków tematycznych	Liczba godzin
P1	Potable water suply pumping station design including equipment for protection against water hammer, cavitaton, water flow regulation.	10
P2	Dynamic and steady state simulations of hydraulic operation of the water distribution system	10

7 Narzędzia dydaktyczne

N1 multimedial presentation

N2 concultaions

N3 teamwork

N4 lectures

N5 assigment

N6 computer lab

8 Obciążenie pracą studenta

Forma aktywności	Średnia liczba godzin na zrealizowanie aktywności
Godziny kontaktowe z nauczycielem akademickim, w tym:	
Godziny wynikające z planu studiów	60
Konsultacje przedmiotowe	30
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	14
Opracowanie wyników	20
Przygotowanie raportu, projektu, prezentacji, dyskusji	20
Sumaryczna liczba godzin dla przedmiotu wynikająca z całego nakładu pracy studenta	**150**
Sumaryczna liczba punktów ECTS dla przedmiotu	6.00

9 Sposoby oceny

Ocena formująca

F1 computer lab report

F2 assigment

F3 Test

Ocena podsumowująca

P1 final test

Warunki zaliczenia przedmiotu

W1 properly prepared assignment

W2 passed test

W3 passed final test

Ocena aktywności bez udziału nauczyciela

B1 assigment prepaed in pairs

Kryteria oceny

Efekt kształcenia 1	
Na ocenę 2.0	student has not gained knowledge on water supply systems operation
Na ocenę 3.0	student has gained more than 50% and less than 60% of knowledge on water supply systems operation presented during the course
Na ocenę 3.5	student has gained more than 60% and less than 70% of knowledge on water supply systems operation presented during the course
Na ocenę 4.0	student has gained more than 70% and less than 75% of knowledge on water supply systems operation presented during the course
Na ocenę 4.5	student has gained more than 75% and less than 80% of knowledge on water supply systems operation presented during the course
Na ocenę 5.0	student has gained more than 80% of knowledge on water supply systems operation presented during the course
Efekt kształcenia 2	
Na ocenę 2.0	student has not gained any teamwork skills during the course
Na ocenę 3.0	student has gained certain teamwork skills during the course
Na ocenę 3.5	student has gained key teamwork skills during the course
Na ocenę 4.0	student has gained better teamwork skills during the course

Na ocenę 4.5	student has gained more better teamwork skills during the course
Na ocenę 5.0	student has gained professional teamwork skills during the course
Efekt kształcenia 3	
Na ocenę 2.0	student has not gained knowledge on sewage disposal systems operation
Na ocenę 3.0	student has gained more than 50% and less than 60% of knowledge on sewage disposal systems operation presented during the course
Na ocenę 3.5	student has gained more than 60% and less than 70% of knowledge on sewage disposal systems operation presented during the course
Na ocenę 4.0	student has gained more than 70% and less than 75% of knowledge on sewage disposal systems operation presented during the course
Na ocenę 4.5	student has gained more than 75% and less than 80% of knowledge on sewage disposal systems operation presented during the course
Na ocenę 5.0	student has gained more than 80% of knowledge on sewage disposal systems operation presented during the course
Efekt kształcenia 4	
Na ocenę 2.0	student has not gained knowledge on design of water supply, storm water and sanitary sewage disposal systems
Na ocenę 3.0	student has gained more than 50% and less than 60% of knowledge on design of water supply, storm water and sanitary sewage disposal systems presented during the course
Na ocenę 3.5	student has gained more than 60% and less than 70% of knowledge on design of water supply, storm water and sanitary sewage disposal systems presented during the course
Na ocenę 4.0	student has gained more than 70% and less than 75% of knowledge on design of water supply, storm water and sanitary sewage disposal systems presented during the course
Na ocenę 4.5	student has gained more than 75% and less than 80% of knowledge on design of water supply, storm water and sanitary sewage disposal systems presented during the course
Na ocenę 5.0	student has gained more than 80% of knowledge on design of water supply, storm water and sanitary sewage disposal systems presented during the course

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_W04 K_W05 K_W06	Cel 1	W1 W2 W3 W4 W5 W7 W8 W14	N1 N2 N3 N4 N5 N6	F1 F2 F3 P1
EK2	K_U15 K_U16 K_U17 K_K01 K_K04	Cel 3	P1	N2 N3 N5 N6	F2
EK3	K_W04 K_W05 K_W06	Cel 2	K1 K2 W5 W6 W7 W8 W9 W10 W11 W12 W13 W14 W15	N1 N2 N3 N4 N5 N6	F1 F2 F3 P1
EK4	K_W03 K_W04 K_W05 K_W06	Cel 1 Cel 2 Cel 3	K1 K2 W1 W5 W11 W12 W13 W14 P1	N1 N2 N3 N4 N5 N6	F1 F2 F3 P1

11 Wykaz literatury

Literatura podstawowa

[1] **Dąbrowski W., Spaczyńska M., Mackie R.I.** — *A model to predict Granular Activated Carbon backwash curves*, , 2008, Clean Soil, Air, Water

[2] **Dąbrowski W., ., Buchta R., Mackie R.I.** — *Impact of water blending on calcium carbonate equilibrium in water distribution systems technical note*, , 2004, Journal of Environmental Engineering, ASCE,

[3] **Dąbrowski W., Buchta R.** — *Statistical evaluation of calcium carbonate equilibrium in natural water,*, , 2000, Lakes& Reservoirs: Research and Management

[4] **Dąbrowski W., Buchta R., Dąbrowska B., Mackie R.I.** — *Calcium carbonate equilibria in water supply systems*, , 2010, Environmental Protection Engineering

[5] **Zielina M., Dąbrowski W., Lang T.,** — *Assessing the risk of corrosion of asbestos cement pipes in Krakóws water supply network*, , 2007, Environmental Protection Engineering

[6] **Zielina M., Dąbrowski W., Radziszewska-Zielina E.,** — *Cement mortar lining as a potential source of water contamination*, , 2014, International Journal of Environmental, Ecologiocal and Mining Engineering

[7] **Dąbrowski W., F. Li** — *Reducing hydrogen sulfide corrosion risk by using higher velocities of wastewater flow through force main*, Forum on Studies of Environment and Public Health Issues in the Asian Mega-cities (EPAM-2015) & Annual Meeting of Environmental Medicine and Health Branch of Chinese Society for Environmental Sciences (EMES-2015) & Annual Meeting of Environmental Medicine and Health Branch of Chinese Society for Environmental Sciences (EMES-2015), 2014, Xiamen, Fujian, China

[8] **Nalluri C., Dąbrowski W.** — *Need for new standards to prevent deposition in wastewater sewers*, , 1994, Journal of Environmental Engineering ASCE

[9] **Dąbrowski W., Piaseczny G.** — *Numerical simulation of domestic wastewater sewer performance,*, , 2000, Lakes& Reservoirs: Research and Management

[10] **Ashley R.M., Dąbrowski W.,** — *Dry and storm weather transport of Coliforms and Faecal Streptococci in combined sewage*, , 1995, Water Sci Technol.,

Literatura uzupełniająca

[1] **Gihorbanian V., Karney B.W., Guo Y.** — *Minimum pressure criterion in Water Distribution Systems: challenges and consequences*, Austin, Texas, 2015, World Environmental and Water Resources Congress 2015: Floods, Droughts, and Ecosystems

12 Informacje o nauczycielach akademickich

Osoba odpowiedzialna za kartę

dr hab. inż. , prof. PK Michał Zielina (kontakt: michal.zielina@pk.edu.pl)

Osoby prowadzące przedmiot

2 prof. dr hab. inż. Wojciech Dąbrowski (kontakt: wdabrow@pk.edu.pl)

3 dr hab. inż. , prof. PK Michał Zielina (kontakt: michal.zielina@pk.edu.pl)

4 dr inż. Joanna Bąk (kontakt: jbak@pk.edu.pl)

13 Zatwierdzenie karty przedmiotu do realizacji

(miejscowość, data) (odpowiedzialny za przedmiot) (dziekan)

Przyjmuję do realizacji (data i podpisy osób prowadzących przedmiot)

. . . .

. . . .

. . . .