

**AGH**AGH UNIVERSITY OF SCIENCE  
AND TECHNOLOGY

Module name: Sustainable water resources management and protection

Academic year: 2019/2020 Code: ZSDA-3-0252-s ECTS credits: 4

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: prof. dr hab. inż. Neverova-Dziopak Elena (elenad@agh.edu.pl)

### Module summary

The aim of the course is to give background to approach the basic issues in the field of extremely current topics related to the rational management of water resources in order to protect them from depletion and degradation. It will be focused on water quality problems, water distributions and relations with other environmental components as well as water supply and wastewater treatment

### Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	able to determine the main goals and the method of priority tasks solution	SDA3A_K01, SDA3A_K03, SDA3A_K02	Participation in a discussion
Skills: he can			
M_U001	water quality and status assessment	SDA3A_U03, SDA3A_U01	Project
M_U002	create data-driven and empirical models of water environment	SDA3A_U06, SDA3A_U01	Project
M_U003	create visualizations and spatial analysis	SDA3A_U07, SDA3A_U06	Project
Knowledge: he knows and understands			
M_W001	objectives, problems and tasks of water management and protection	SDA3A_W01, SDA3A_W05	Essay

M_W002	general water resources structure, kinds of water usage, sources and consequences of water pollution, methods of water status monitoring and modeling	SDA3A_W01, SDA3A_W05	Test
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## Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
60	30	30	0	0	0	0	0	0	0	0	0

## FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	able to determine the main goals and the method of priority tasks solution	-	+	-	-	-	-	-	-	-	-	-
Skills: he can												
M_U001	water quality and status assessment	-	+	-	-	-	-	-	-	-	-	-
M_U002	create data-driven and empirical models of water environment	-	+	-	-	-	-	-	-	-	-	-
M_U003	create visualizations and spatial analysis	-	+	-	-	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	objectives, problems and tasks of water management and protection	+	-	-	-	-	-	-	-	-	-	-
M_W002	general water resources structure, kinds of water usage, sources and consequences of water pollution, methods of water status monitoring and modeling	+	-	-	-	-	-	-	-	-	-	-

## Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	60 h
Preparation for classes	8 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	8 h
Realization of independently performed tasks	20 h
Examination or Final test	2 h
Contact hours	2 h
Summary student workload	100 h
Module ECTS credits	4 ECTS

## Additional information

### Module content

#### Lectures

##### Sustainable water resources management and protection

1. Basic definitions and concepts. The structure of water resources, quantitative and qualitative characteristics of water resources. Water resources as an ecological indicator of socio-economic development.
2. Priority issues in water management. Water shortages, floods, droughts, extreme hydrological phenomena, water balance, degradation of water ecosystems.
3. Water protection, indicators of water quality criteria and water quality standards; classification and evaluation of water status. Contamination of surface water and groundwater; the sources of contamination; the main groups of pollutants. The consequences of water pollution; self-purification processes in surface waters. Priority issues in the field of water protection and conservation. Technical, legal and organizational issues of water protection
3. Fundamentals of water supply and wastewater treatment
5. Sustainable water management: legal, technological and social aspects

#### Auditorium classes

##### Sustainable water resources management and protection

1. Water quality assessment – physical and chemical elements
2. Water quality assessment – biological elements
3. Eutrophication models
4. Hydrology statistics
5. Water quality distribution and risk
6. Rainfall time series
7. Water monitoring data collection, analysis and visualization
8. River basin management

### Teaching methods and techniques:

Lectures: Classical lecture with multimedia

Auditorium classes: Short presentation, then calculations, data analysis, modeling and visualizations mostly on computers

### **Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:**

Grading:

3 projects

1 in-class exam

Corrective rules are the same

### **Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:**

Lectures:

- Attendance is mandatory: No

- Participation rules in classes: The lecture is NOT obligatory

Auditorium classes:

- Attendance is mandatory: Yes

- Participation rules in classes: Classes are obligatory

### **Method of calculating the final grade**

Final grade = 70% grade from classes + 30% grade from in-class exam

### **Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:**

Please justify your absence, make projects done and wrote the in-class exam

### **Prerequisites and additional requirements**

Basics on R programming language, spreadsheet and selected computing environment

### **Recommended literature and teaching resources**

Freshwater Ecology: Concepts and Environmental Applications of Limnology. Walter Kennedy Dodds, Matt R. Whiles

An Introduction to R. W. N. Venables, D. M. Smith and the R Core Team

### **Scientific publications of module course instructors related to the topic of the module**

The development of the eutrophication process in Dobczyce Reservoir / Elena NEVEROVA-DZIOPAK, Zbigniew KOWALEWSKI // W: INFRAEKO 2018 : modern cities: infrastructure and environment : VI international conference of science and technology : Krakow, June 7-8, 2018 : book of abstracts / eds. Agnieszka Stec, Daniel Słyś ; Rzeszów University of Technology. The Faculty of Civil and Environmental Engineering and Architecture. Department of Infrastructure and Water Management. — Rzeszów : [UR], 2018. — S. 75

Foundation and application of new method of trophic state assessment — Powstanie i zastosowania nowego sposobu oceny stanu troficznego wód / Elena NEVEROVA-DZIOPAK, Zbigniew KOWALEWSKI // Geomatics and Environmental Engineering ; ISSN 1898-1135. — Tytuł poprz.: Geodezja oraz Inżynieria Środowiska. — 2018 vol. 12 no. 2, s. 63-79. — Bibliogr. s. 77-78

Analysis of Mariupol metallurgical enterprises influence on ecological state of surface waters — Analiza wpływu zakładów metalurgicznych w Mariupolu na stan ekologii wód powierzchniowych / Olena Dan, Elena NEVEROVA-DZIOPAK, Eleonora Butenko, Alexey Kapustin // Geomatics and Environmental Engineering ; ISSN 1898-1135. — Tytuł poprz.: Geodezja oraz Inżynieria Środowiska. — 2017 vol. 11 no. 1, s. 25-31.

Modelling of chlorophyll-a content in running waters — Modelowanie zawartości chlorofilu-a w wodach płynących / Elena NEVEROVA-DZIOPAK, Zbigniew KOWALEWSKI // Proceedings of ECOpole / Society of Ecological Chemistry and Engineering ; ISSN 1898-617X. — 2016 vol. 10 no. 2 pt. 1, s. 455-462. — Bibliogr. s. 461-462

Towards methodological problems of trophic state assessment of running waters — Metodologiczne problemy oceny stanu troficznego wód płynących / Elena NEVEROVA-DZIOPAK, Zbigniew KOWALEWSKI // Ecological Chemistry and Engineering = Chemia i Inżynieria Ekologiczna. S ; ISSN 1898-6196. — 2014 vol. 21 iss. 4, s. 637-650.

**Additional information**

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