Course title:	Contaminant migration in the soil-water environment
Course title in Polish:	Migracja zanieczyszczeń w środowisku gruntowo-wodnym
Course for discipline:	Civil Engineering, Geodesy and Transport

Semester:	7	**Status of course:**	faculty	**Language:**	english
Academic year:		**Catalog number:**			

Coordinator of course:	dr hab. inż. Anna Podlasek, prof. SGGW
Lecturer od course:	dr hab. inż. Anna Podlasek, prof. SGGW
Executing unit:	Institute of Civil Engineering, Department of Revitalization and Architecture
Ordering unit:	Doctoral School SGGW
Assumptions, goals and description of the course:	The aim of the course is to provide doctoral students with a basic knowledge of contamination of the soil and water environment and the factors that determine it. Thematic topics will include: (1) hydrogeological properties of the soil, (2) laboratory methods for determining parameters of contaminant migration in groundwater, (3) processes of contaminant migration, (4) sorption models, (5) assessment of groundwater susceptibility to contamination, (6) modelling of groundwater flow and contaminant transport in the vicinity of selected objects that are sources of groundwater contamination.
Didactic form, number of hours:	Lecture 5h and project 5h
Teaching methods:	Multimedia lecture, calculation exercises,
Limit of people in the group:	15

Learning outcomes

KNOWLEDGE - the graduate knows and understands:	**SKILLS - the graduate is able to:**	**COMPETENCES - the graduate is ready to:**
To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	Critically evaluate the achievments in the field/discipline represented
Major general development trends in the field/discipline		Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect
		Support the ethos of scientific circles and conduct independent research

The method of verification of learning outcomes:	Evaluation of student activity on the basis of observation during classes, evaluation of oral answer / speech on the implemented project
Form of documentation of achieved learning outcomes:	The content of questions on the subject matter of exercises, individual questions on completed student projects. Individual student evaluation sheets, entry in the eHMS system.
Elements and weights of the final grade:	Final evaluation: Oral credit (project defense), including: 25% - evaluation of the project and student activity on the basis of observation in class, 25% -- answer to questions on the project, 50% - answer to questions on the topic of lectures.
Place of the course:	Classroom

Basic and supplementary literature

Basic literature:
1. Dąbrowski S., i inni, 2011: Metodyka modelowania matematycznego w badaniach i obliczeniach hydrogeologicznych. Poradnik metodyczny, Poznań.
2. Dowgiałło J., Kleczkowski A. S., Macioszczyk T., Różkowski A. (red.), 2002: Słownik hydrogeologiczny. Państwowy Instytut Geologiczny, Warszawa.
3. Kleczkowski A., i inni, 1984: Ochrona wód podziemnych, Wydawnictwa Geologiczne.
4. Małecki J. i inni, 2006: Wyznaczanie parametrów migracji zanieczyszczeń w ośrodku porowatym dla potrzeb badań hydrogeologicznych i ochrony środowiska, Poradnik metodyczny, UW Wydział Geologii, Warszawa.
5. Pazdro Z., Kozerski B., 1990: Hydrogeologia ogólna., PAE, Warszawa.
6. Witczak, S., Adamczyk, A., 1995: Katalog wybranych fizycznych i chemicznych wskaźników zanieczyszczeń wód podziemnych i metod ich oznaczania, t.1. PIOŚ. Biblioteka Monitoringu Środowiska, Warszawa.
Supplementary literature:
1. Appelo, C.A.J., Postma, D., 1999: Geochemistry, groundwater and pollution. A.A. Balkema, Rottermdam, Brookfield.
2. Domenico P.A., Schwartz F.W., 1990: Physical and chemical hydrogeology. John Wiley & Sons, USA.
3. Fetter C.W., 1994: Applied hydrogeology. Prentice Hall. Inc. A Simon & Schuster Company Englewood Cliffs, New Jersey, USA.
4. Rowe, R.K., Quigley, R.M., Brachman, R.W.I., Booker, J.R., 2004: Clayey barrier systems for waste disposal facilities. 2nd edition. CRC Press, Boca Raton, USA.
5. Yong, R.M., Mulligan, C.N., 2004: Natural attenuation of contaminants in soils. CRC Press, Boca Raton, FL.
6. Yong, R.N., Nakano, M., Pusch, R., 2012: Environmental Soil Properties and Behaviour. CRC Press Taylor and Francis Group, Boca Raton.

Comments:	non

Estimated number of hours of work of the doctoral student necessary to achieve the assumed learning outcomes:	30h

Leraning outcomes reference to the second degree characteristics of the National Qualification Framework (level 8) covering doctoral competences:

Symbol:	**Learning outcomes:**	**8 level NQF**
SD1_KW01	To the extent enabling to revise the existing pradigms in the field/discipline - the world achievments, gathering theoretical background as well as general and selected detailed issues	P8S_WG
SD1_KW02	Major general development trends in the field/discipline	P8S_WG

SD1_KU05	Carry out critical assessment of the scientific research findings and expert activities and their contribution to the knowledge development in the field/discipline	P8S_UW
SD1_KK01	Critically evaluate the achievments in the field/discipline represented	P8S_KK
SD1_KK03	Recognise knowledge in solving cognitive and practical problems characteristic for the area of research (field/discipline) and in an interdisciplinary aspect	P8S_KK
SD1_KK08	Support the ethos of scientific circles and conduct independent research	P8S_KR