



SZKOŁA GŁÓWNA  
GOSPODARSTWA  
WIEJSKIEGO

## Exploitation and Monitoring of Hydraulic Structures

### Educational subject description sheet

#### Basic information

<b>Field of study</b> Course Offer for exchange students - second cycle studies, including uniform master studies (MA programmes)		<b>Didactic cycle</b> 2024/25	
<b>Speciality</b> -		<b>Subject code</b> PWMPWM2S_D.B100000P.06289.24	
<b>Organizational unit</b> Course Offer for exchange students		<b>Lecture languages</b> english	
<b>Study level</b> second cycle studies, including uniform master studies (MA programmes)		<b>Mandatory</b> Elective subjects	
<b>Study form</b> full-time studies		<b>Block</b> Basic subjects	
<b>Education profile</b> General academic		<b>Disciplines</b>	
<b>Coordinator</b>	Andrzej Głuchowski		
<b>Teacher</b>	Andrzej Głuchowski		
<b>Period</b> Winter semester	<b>Examination</b> Exam	<b>Number of ECTS points</b> 2	
	<b>Activities and hours</b> Lecture: 15 Project exercises: 15		

## Goals

Code	Goal
C1	Providing students with basic knowledge about hydraulic structures and their importance in civil engineering and water resources management.
C2	Providing students with the technical knowledge and skills necessary to design, build and maintain hydraulic structures, including dams and flood embankments.
C3	Develop critical thinking and problem-solving skills in relation to hydraulic structures, including the ability to identify potential problems and implement appropriate monitoring and maintenance strategies.
C4	To prepare students for careers in civil engineering and related fields where they may be involved in the planning, design, construction or operation of hydraulic structures.
C5	Raising awareness of the social, economic and environmental effects of hydrotechnical structures, including potential risks and benefits related to their construction and operation.
C6	Encouraging innovation and creativity in the development of new technologies and techniques for monitoring and maintaining hydraulic structures.

## Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
<b>Knowledge - Student knows and understands:</b>			
W1	legal basis for the use and monitoring of information		Written exam
W2	construction and principles of designing control and measurement equipment		Written exam
W3	principles of assessing the technical condition of buildings		Written exam
<b>Skills - Student can:</b>			
U1	recognize and determine the technical condition of buildings		Project
U2	to plan control tests of the building object		Project
<b>Social competences - Student is ready to:</b>			
K1	acts consciously and understands the ethical, design and technical aspects of the monitoring system and the responsibilities related to the security of the system		Written exam, Project

## Study content

No.	Course content	Subject's learning outcomes	Activities
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1.	<p>1. Legal basis for the operation of construction facilities.</p> <p>2. Statistical analysis of the causes of failure of earth structures.</p> <p>3. Principles of inventory of the existing state.</p> <p>4. Mechanisms of loss of general and local stability.</p> <p>5. Construction and design of control and measurement equipment for the measurement of: stresses, displacements, pore and piezometric pressures.</p> <p>6. Flows and leaks. Interpretation of measurement results.</p> <p>7. Control tests; geotechnical, filtration velocity markers, geophysical (seismic, electrical resistivity, geoelectric, thermal).</p> <p>8. Principles of assessing the technical condition of the facility, principles of conducting permanent and periodic inspections of buildings, control and measurement equipment used to monitor earthworks and principles of its arrangement, installation and operation, controlled quantities, interpretation of measurement results, classic and automatic monitoring, principles of system design monitoring, rules for assessing the safety and technical condition of buildings.</p>	W1, W2, W3, K1	Lecture
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2.	<p>Topic 1: Site survey and data collection</p> <p>Introduction to field testing and data collection for hydraulic structures Field activities such as surveying, drilling and sampling Data analysis and interpretation</p> <p>Topic 2: Design and construction of hydrotechnical structures</p> <p>Introduction to the principles and methods of designing hydraulic structures Case studies of successful and unsuccessful construction projects and practices Group project regarding the design and construction of a small hydrotechnical structure</p> <p>Topic 3: Instrumentation and monitoring of hydrotechnical structures</p> <p>Introduction to instrumentation and techniques for monitoring hydraulic structures Installation of various types of sensors and instrumentation, including piezometers, inclinometers, strain gauges Data collection and analysis using computer programs and statistical methods</p> <p>Topic 4: Maintenance and repair of hydraulic structures</p> <p>Introduction to maintenance and repair techniques for hydraulic structures Identification and assessment of common structural problems and their causes Practical exercises in repair and maintenance of hydraulic structures</p> <p>Topic 5: Risk assessment and management of hydraulic facilities</p> <p>Introduction to risk assessment and management for hydrotechnical structures Identification and assessment of potential hazards and threats related to hydrotechnical facilities Development of risk management plans and crisis response strategies</p>	W3, U1, U2, K1	Project exercises
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### Course advanced

Activities	Methods of conducting classes
Lecture	Lecture
Project exercises	Problem lecture, Case study

Activities	Examination method	Percentage
Lecture	Written exam	50%
Project exercises	Project	50%

<b>Activities</b>	<b>Credit conditions</b>
Lecture	Knows the answer to at least 50% of 5 out of 20 questions.
Project exercises	He successfully completed a project related to the preparation of monitoring of a selected water structure.

## Literature

### Obligatory

1. Novak, P., Moffat, A. I. B., Nalluri, C., & Narayanan, R. A. I. B. (2017). Hydraulic structures. CRC Press.
2. Penman, A. D. Instrumentation, monitoring and surveillance: embankment dams. Routledge; 1st Edition (May 2, 2018)
3. Yilmaz, Ö. Levees and Dams: Advances in Geophysical Monitoring and Characterization. Springer Nature; 1st ed. 2019 edition (November 20, 2019)

### Optional

1. Nelson, K. Design & Construction of Small Earth Dams. Butterworth-Heinemann (November 18, 1999)
2. Goldin, A. L. (2017). Design of earth dams. Routledge; 1st edition (July 12, 2017)
3. Gupta, R. S. (2016). Hydrology and hydraulic systems. Waveland Press.
4. Fell, R. (2005). Geotechnical engineering of dams. CRC press.
5. Kalinski, M. E. (2011). Soil mechanics: lab manual (No. Ed. 2). John Wiley & Sons.

## Calculation of ECTS points

<b>Activity form</b>	<b>Activity hours*</b>
Lecture	15
Project exercises	15
Preparing the project	15
Preparation for the exam	15
<b>Student workload</b>	<b>Hours</b> 60
<b>Number of ECTS points</b>	<b>ECTS</b> 2

\* hour means 45 minutes