SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Small bridges and culverts- hydroelectric small power plants

Educational subject description sheet

Basic information

Field of study Civil Engineering **Speciality** - **Organizational unit** Faculty of Civil and Environmental Engineering **Study level** second cycle (post-engineering degree) **Study form** full-time studies **Education profile** General academic	**Didactic cycle** 2024/25 **Subject code** BISCES_D.47K.03942.24 **Lecture languages** english **Mandatory** Elective subjects **Block** Major subjects **Disciplines** Civil engineering, surveying and transportation

Coordinator	Marta Kiraga
Teacher	Marta Kiraga

Periods	**Examination**	**Number of ECTS points**
Semester 1, Semester 2, Semester 3	Pass with grade **Activities and hours** Lecture: 15 Project exercises: 30	4

Goals

Code	Goal
C1	The purpose of the course is to familiarize the student with the design, construction and operation of small bridges and culverts as civil engineering structures on roads and railroads, as well as with the applicable norms, guidelines, etc. Necessary knowledge of hydrology, hydraulics and structural engineering will be organized and given in terms of their use in the design of water engineering structures of road construction. The scope of of the course also includes the issues of designing bridges in terms of their use them for animal crossings. Hydroelectric small power plants operation routines and exemplary constructions are discussed.

Entry requirements

The student has knowledge of the basics of hydraulic engineering, has the ability to use of standards, guidelines and surveying materials and computer programs

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	determine the basic phenomena associated with the flow of water under bridges and through conduits of culverts.	CE_K4_W01_inz, CE_K4_W07_inz	Written credit
Skills – Student can:			
U1	design a small bridge and culvert, can select the conduit outlet structure and outlet of the structure and can make technical drawings of road crossings.	CE_K4_U01_inz	Project
U2	determine the conditions of animal migration through water-combined crossings understanding the non-technical aspects of its activity and its impact on the environment.	CE_K4_U01_inz	Project
Social competences – Student is ready to:			
K1	plan investments of water road crossings using the achievements of science and technology, acting creatively in a team.	CE_K4_K02	Project

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Lecture topics: The role of water engineering structures of road and railroad construction in the maintenance of traffic routes transportation. Basic elements of bridge structures: lumen, spans, elevation of the bottom of the of the structure above the water table, damming and others. Scope of necessary measurements and surveys: surveying, hydrological, geotechnical, hydraulic. Measurable flows and water levels. Hydraulic calculations of small bridges: scope of calculations, the course of calculations of the bridge light, cases of calculations, bottom scour, calculations of damming upstream of the bridge. Types and structures of abutments, pillars, chambers. Carriageway superstructure. Drainage, lighting, shoulders, connections and supports of roadway structures. Typification and prefabrication of small bridge structures. Hydraulic and hydrological calculations of culverts. Scope and principles, requirements, divisions and hydraulic schemes of culverts. Light of culverts and damming: inlet structures and hydraulic schemes. Calculations and constructions of the lower position of lowland culverts, shaping of the outfall, fortifications, depth of dilution. Types of culvert structures, requirements for organization, quality of works execution, maintenance. Design of animal crossings under bridges and in conduits culverts.	W1, U1, U2, K1	Lecture, Project exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture
Project exercises	Discussion, Design method

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

Activities	Credit conditions
Lecture	Written credit 50%; Project 50%
Project exercises	Written credit 50%; Project 50%

Literature

Obligatory

1. Neil C. R. (Ed.), 1973: Guide to bridge hydraulics. University of Toronto Press.
2. Błażejewski, R., Pilarczyk, K. W., i Przedwojski, B. (1995). River Training Techniques: Fundamentals, Design and Applications. Rotterdam: Balkema, CRC Press.
3. Chow, V. T. (1959). Open-channel hydraulics. McGraw Hill.

Calculation of ECTS points

Activity form	**Activity hours***
Lecture	15
Project exercises	30
Preparing the project	75
Student workload	**Hours** 120
Number of ECTS points	**ECTS** 4

* hour means 45 minutes

Effects

Code	Content
CE_K4_K02	The graduate is ready to act consciously and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made.
CE_K4_U01_inz	The graduate is able to classify complex building objects and assess, calculate and list complex impacts on these objects.
CE_K4_W01_inz	The graduate knows and understands in an extended scope issues from selected areas of mathematics, physics and chemistry, required to solve complex issues in the Civil Engineering.
CE_K4_W07_inz	The graduate knows and understands the principles of creating quality management procedures, has knowledge about the cost effectiveness and time of implementation of construction projects in conditions of risk and uncertainty, knows and understands the principles of sustainable development and the basics of spatial planning and the impact of construction investments on the environment.