56S1-OCHIRJ   **CONSERVATION AND RESTORATION OF LAKES**   **ECTS: 3.0**

HOURS PER SEMESTER/WEEK: LECTURES: 15/1; CLASSES: 30/2   **Course status:** optional *
FIELD OF THE STUDY: Environmental protection   **Year of the study:** IV
Level of study: First-cycle (Engineer's degree) program

COURSE CONTENTS
LECTURES: The importance of lakes in the landscape. Location and resources of lakes in Poland and in Europe. Eutrophication of lakes - definition, causes and effects. Trophic types of lakes. Factors causing natural and anthropogenic degradation of water ecosystems. Sources of pollution reaching waters. Protective measures applied in the catchments of lakes. The importance of biogeochemical barriers in the protection of surface waters. Methods of technical and biological reclamation of lakes (selective drainage of bottom waters, flushing of lakes, artificial aeration, inactivation of biogenic compounds, deactivation and removal of sediments, control of macrophyte and algae biomass). Domestic and foreign solutions in the field of lake renewal. Legal and administrative tools in the protection and reclamation of lakes in Poland and other countries.

CLASSES: Determination of the quality of stagnant surface waters according to the current classifications. Assessment of susceptibility of lakes to degradation. Trophic status and water quality. Determining the trophic level of lakes based on the concentration of nutrients in water. Determining the external load of pollutants on lakes. Determination of acceptable and dangerous loads for different types of lake ecosystems. Developing the assumptions for the protection of lakes and selecting the appropriate method of their reclamation.

EDUCATIONAL PURPOSE: Learning about the mechanisms and effects of natural and anthropogenic transformation and degradation of lakes, acquiring the skills to assess the ecological status and threats to the aquatic environment, and to take protective measures to renaturalize various types of water.

LEARNING OUTCOMES
Knowledge. Has knowledge about the functioning of lakes and their environmental role. Knows and understands the connections between water reservoirs and their catchments, understands the risks resulting from the improper use of lakes. He has knowledge of the principles of protection planning and the effectiveness of various methods of lake reclamation.
Skills. Has the ability to assess the degree of degradation risk of lakes based on environmental data (morphometry, catchment conditions). Is able to interpret the results of monitoring data for the assessment of the state of lakes. Is able to assess the suitability of various methods of lake reclamation, as well as the possibility and desirability of their use for a specific water body.
Social competences. Understands and appreciate the natural and economic role of lakes in the landscape. He is aware of the negative effects of excessive anthropopressure and understands the need to protect aquatic ecosystems.

TEACHING FORMS AND METHODS
Lectures. Lecture with a multimedia presentation
Classes. Subject-project auditorium exercises - implementation of a research project supplemented with subject-specific exercises and field activities - presentation of research methods and examples of water protection and reclamation.

FORM AND CONDITIONS FOR VERIFICATION OF LEARNING OUTCOMES
Lectures. The final test on lecture material, test-descriptive form.
Classes. Auditorium exercises - A test on the exercise material - in a mixed form, including test and descriptive questions as well as practical and interpretative tasks. Report - Final study of the exercises (report, research project).

BASIC LITERATURE
1) Wetzel R.G., Limnology. Lake and river ecosystems. Elsevier Academic Press, 2001, pp. 1006. 2) Chin D.A., Water-quality engineering in natural systems. Willey-John Wiley and Sons Inc., 2006, pp 610. 3) Dodds W.K., Whiles M.R., Freshwater ecology. Concepts and environmental applications of limnology. Elsevier Academic Press, 2010, pp. 811.

ADDITIONAL LITERATURE
1) Smol J.P., Pollution of lakes and rivers. Blackwell Publishing, 2008, pp. 383. 2) Stumm W., Morgan J.J., Aquatic chemistry. John Wiley and Sons Inc., 1996, pp. 1022. 3) Lee C.C., Lin S.D., Handbook of environmental engineering calculations. McGraw Hill Handbooks, 2007, pp. 1712. 4) Carpenter S.R., Kitchell J.F., The trophic cascade in lakes. Cambridge University Press, 1996, pp. 385.

THE TEACHER/TEACHERS CONDUCTING THE CLASSES:
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* note: optional course availability depends on Polish students' choice!