UNIVERSITY OF WARMIA AND MAZURY
Faculty of Agriculture and Forestry

56S1-MGWEIOS **GEODESY METHODS IN ECOLOGY AND ENVIRONMENTAL PROTECTION (optional)** **ECTS: 3.0**

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

Course status: optional *
Year of the study: IV

COURSE CONTENTS
LECTURES: Geodetic measurement methods. Geodetic and cartographic law. Technical manuals and geodetic standards. Coordinate systems used in Poland and their transformations. Coordinate systems on the plane. Base map. Measurements of angles and lengths - rangefinders and theodolites. Situational measurements. Height measurements - method of geometric leveling, technical levels, leveling networks, trigonometric levelling. Situational and height measurements, total stations, classic and electronic total stations. Geodetic networks. Cartography. Photogrammetric photos and satellite images. Numeric map as part of a geographic information system (GIS). Global positioning systems (GPS).

CLASSES: Measurable quantities, units of measurement, scale. Measurement errors and their compensation. Calculus elements in coordinates. Calculation and alignment of measurement lines. Calculation of the coordinates of points based on measurements. Map mapping. Forms of relief and ways of mapping it. Conventional signs on basic and topographic maps. Determining surfaces on maps. Construction and operation of classic measuring equipment: theodolites and levellers. Taking measurements with the GPS RTK set. Field exercises: practical performance of survey measurements in the field with the use of classic equipment and GPS and their development.

EDUCATIONAL PURPOSE: Familiarizing students with the specificity of acquiring spatial data about the environment, as well as acquiring the ability to solve basic geodetic and cartographic tasks related to the inventory of environmental elements, as well as the implementation of investments.

LEARNING OUTCOMES
Knowledge. Demonstrates knowledge of basic measurement techniques to obtain spatial data about the environment. Has structured and theoretically based knowledge in the field of construction and operation of classical geodetic equipment and using GPS technology, along with computational and graphical processing of measurement results. He knows the methods of creating maps related to the inventory of environmental elements and understands their content.
Skills. Can properly select and use the known geodetic measurement methods to identify and analyze the state of the environment. Uses basic geodetic equipment to perform inventory and implementation measurements. Recognizes and understands the content of the basic and topographic map.
Social competences. Is aware of the responsibility for his own work and is ready to comply with the rules of teamwork and take responsibility for jointly implemented tasks. He understands the need to constantly improve the skills of using geodetic equipment, especially in view of the development of GPS technology.

TEACHING FORMS AND METHODS
Lectures. Informative lecture with a multimedia presentation
Classes. Subject exercises, and group work as part of field exercises.

FORM AND CONDITIONS FOR VERIFICATION OF LEARNING OUTCOMES
Lectures. Colloquium partly test, partly with open questions.
Classes. Summary report from field exercises and written colloquium, partly test, partly with open questions.

BASIC LITERATURE
1) Kaula W.M. 2000. Theory of Satellite Geodesy. Dover Publications Inc., ss. 140. 2) Hooijberg M. 2012. Practical Geodesy. Springer Berlin, ss. 308. 3) De Lima M. 2015. Handbook of Cartography. Callisto Reference, ss.326. 4) Muller J. 2012. Geodesy. De Gruyter, ss. 434.

ADDITIONAL LITERATURE
1) Hatzopoulos J.N. 2008. Topographic Mapping: Covering the Wider Field of Geospatial Information Science & Technology (GIS&T). Universal Publishers, ss. 740. 2) Kent A., Vujakovic P. 2017. The Routledge Handbook of Mapping and Cartography. Routledge, ss. 594.

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