

MODULE INFORMATION SHEET

Name of Module Unit	Land Reclamation and Development
Name in polish language	Rekultywacja i zagospodarowanie terenu
Module type	compulsory / elective
Form of studying	full-time day courses
Level of study	graduate course (M.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environment Protection Engineering
Responsible department	Chair of Environmental Protection and Management
Responsible person	Andrzej Kulig, D.Sc. Ph.D. prof. WUT

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
4	15		15		15	3

Learning outcomes (knowledge, skills, competences)

Student has a **knowledge** of the most important aspects of land reclamation and land use, including the purpose and tasks of degraded land reclamation, rules for determining the directions of reclamation and post-reclamation land use. Has knowledge of the selection of materials used in reclamation and knows the methods of reclamation of degraded areas, including contaminated land, e.g. products petroleum. Student has **skills** to classify and assess the reclamation usefulness of various soil formations in terms of their development and is able to determine the state of soil degradation. Has the ability to interpret own research against the background of other similar studies and phenomena associated with significant processes occurring in soil and is able to present an oral presentation on the implementation of the research task Has the ability to use literature sources and online resources for developing a project on the implemented issue and is able to choose the direction of reclamation and justify it taking into account natural and social conditions. Has the ability to implement elements of technical and biological reclamation at a landfill, excavation or other degraded area. Student has social **competences** - is able to act creatively while working in a team, being aware of respect for ethics and copyrights. Can formulate problems and is aware of his skills and strives to deepen his knowledge.

Prerequisites

Principles of Soil Diagnostic Techniques; Irrigation and Drainage

Rules for integrated grade setting

Lecture (40%), laboratory (30%), project (30%)

Recommended readings

1. Gołda T. (2005): Rekultywacje. Scientific and Didactic Publishing House of Academy of Mining and Metallurgy, Cracow.
2. Karczewska A. (2008): Ochrona gleb i rekultywacja terenów zdegradowanych. Wrocław University of Environmental and Life Sciences, Wrocław.
3. Keijzer Th., Pijls Ch., Marnette E., Sumann M., van Zutphen M. (2006). In situ soil and groundwater remediation: theory and practice. Tauw bv, Deventer.
4. Maciak F. (2003): Ochrona i rekultywacja środowiska (3rd Edition). Publishing House of SGGW, Warsaw.

5. Nathanail C.P., Bardos R.P. (2004): Reclamation of Contaminated Land. John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, England.
6. Page G.W. (1997): Contaminated Sites and Environmental Cleanup: International Approaches to Prevention, Remediation, and Reuse. Academic Press.
7. Remediation Engineering of Contaminated Soils (2000): Ed. D.L. Wise, D.J. Trantolo, E.J. Eichon, H.I. Inyang and U. Stottmeister. Marcel Dekker, Inc. New York.
8. Remediation of Soil and Groundwater. Opportunities in Eastern Europe (1996): Ed. E.A. McBean, J. Balek, B. Clegg. Kluwer Academic Publishers, Dordrecht.
9. Schwab G. O., Fangmeier D. D., Elliot W. J., Frevert R. K. (1993): Soil and Water Conservation Engineering (4ed Edition). John Wiley & Sons. Inc., Toronto, New York.
10. Siuta J. (1998): Rekultywacja gruntów – poradnik. Environmental Protection Institute, Warsaw.
11. Technologie rekultywacji gleb (2004): Monograph. (Aut.: B. Gworek, A. Barański, I. Kondzielski, R. Kucharski, A. Sas-Nowosielska, E. Malkowski, K. Nogaj, D. Rzychon, A. Worsztynowicz). Environmental Protection Institute, Warsaw.
12. Instructions for laboratory and project exercises.
13. Internet resources (credible website sources only!)

Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	Reclamation - basic concepts and tasks: the purpose and tasks of reclamation of degraded areas, land surface, the need for reclamation on a national scale.	2	S
2	Legal aspects of land reclamation and post-reclamation management: (laws and regulations). Review of causes and forms of degradation of the soil environment for the purposes of its reclamation and protection. Reclamation demands, directions of land reclamation and development.	2	S
3	Rules for determining the directions of reclamation and land reclamation management. Land reclamation as a process - reclamation phases and their elements. Monitoring of the effects of reclamation.	3	S
4	Natural and technical methods of soil recovery. Plant habitat in the aspect of the reclamation process. The role of plants in remediation. Review of major plants used in land reclamation and post-reclamation management.	3	S
5	Review of materials used in remediation: natural materials, geotextiles, hydrogels. Basic engineering principles of height formation in earthworks in reclamation (geotechnical safety of earthworks: slope and slope stability, settlement, creep embankments).	3	S
6	Methods of land reclamation: eroded and post-flood soils, areas distorted by mining activities, chemical waste storage areas, combustion waste storage areas, municipal waste storage areas, as well as land contaminated with petroleum products.	2	S
Total		15	hours

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

Lecturers

Andrzej Kulig, D.Sc. Ph.D. prof. WUT

Assessment method

Exam

Contents of laboratory

	Topics	Time (hrs.)	Scope (S / Ex)
1	Determination of percentage content of dust and silt fraction. Determination of lithologic index (WL). Determination of soil cohesion index (WSp) on the basis of the plasticity index value.	4	S
2	Determination of CaCO ₃ sorptive capacity and content. Determination of the sorption index (WSo) and calcium index (WCa). Determination of soil salinity on the basis of electrolytic conductivity. Determination of chlorides and sodium contents.	4	S
3	Determination of soil reaction and its neutralisation. Determination of selected nutrients: ammonia nitrogen, phosphorus and potassium.	4	S
4	Determination of reclamation suitability classification according to Żuławski and Bonitation Number (LB). Presentation of the research results in terms of the evaluation of the reclamation suitability of the examined formations.	3	S
Total		15	hours

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

Persons responsible for laboratory

Mirosław Szyłak-Szydłowski, PhD, DSc

Assessment method for laboratory

Laboratory reports, presentation

Contents of guided projects

	Topics	Time (hrs.)	Scope (S / Ex)
1	Identification of reclamation problems.	2	S
2	Choice of reclamation direction and post-reclamation management.	2	S
3	Basics of earthworks design in reclamation and principles of earthmoving machinery selection.	3	S
4	Reclamation and post-rehabilitation program.	3	S
5	Elements of the technical reclamation project.	3	S
6	Elements of the biological reclamation project.	2	S
Total		15	hours

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

Persons responsible for guided projects

Mirosław Szyłak-Szydłowski, PhD, DSc

Assessment method for guided projects

Project task assessment
