Course Descriptions for the Joint Study Programme
"International Master of Science in Engineering, Entrepreneurship and Resources (MSc. ENTER)

Version 09.2019

Courses at **University of Miskolc**
with the Specialization "**Environmental Engineering" with the focus on Waste Management**

Module Name	**Environmental geology**
ECTS Credits	**4**
Responsible	Viktór Mádai Dr., associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	The main objective of the course is to make the students familiar with the effects of geological medium on the state and changes of the environment, and prepare them for revealing the geological background of environmental problems as well as mitigating or minimizing these problems. **Competencies to evolve (see Appendix 1):** T1, K1, K10, A1, F1, F4
Contents	System approach in geology, changes in the four main systems of the Earth. The objects, methods and legal background of environmental geology. Environmental minerals, their characteristics and role in causing and mitigating of environmental problems. Geological hazards (volcanism, earthquakes, mass movements). The role of geological medium in the anthropogenic contamination and pollution (processes of environmental geochemistry, interactions between soil, rocks and contamination, geological conditions effecting on the spreading of contamination). Geological and geochemical concerns of the effects of mining on the environment. Geological background of the radioactive waste disposal. Geology in nature protection. Geological tasks in the environmental assessment. Practical work: self-made solutions of simple case-study problems.
Teaching Methods	Lecture: 2 contact hours per week Seminar: 1 contact hour per week
Assessment Methods	Exam Students will be assessed with using the following elements. Attendance 15 % Individual report 10 % Midterm exam 40 % Final exam 35 % Total 100%
Grading	Grading scale: % value Grade 90 -100% 5 (excellent)

	80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)
Materials/literature	F. G. Bell: Geological Hazards: their assessment, avoidance and mitigation. E & FN Spon, London, 1999 L. W. Lundgren: Environmental Geology. Prentice-Hall Inernational, London, 1999. C. W. Montgomery: Environmental Geology. McGraw-Hill Companies, Boston, New York, San Francisco, 2005
Note	Compulsory

Module Name	**Basics of environmental processing**
ECTS Credits	**2**
Responsible	József Faitli Dr., habilitated associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	Environmental processing deals with the processes, machines and technologies of cleaning and keeping clean the air, water and soil. The aim of the course is let the students learn the mainly mechanical processing theoretical and practical fundamental knowledge necessary for the design, sizing and operation of the processes, machines and technologies of environmental processing. **Competencies to evolve (see Appendix 1):** T1, K7, K10, A1, A2, A3, F1, F3, F4
Contents	Physical characterization of coarse disperse systems. Rheological properties of one- and multiphase media. Steady-state and unsteady-state particle motion in Newtonian and non-Newtonian media. Motion of particles bulks. Flow through a particles bulk. Permeability tests. Particle motion in electrostatic field. Particle motion in centrifugal field. Forming of bubbles in liquids and their motion. Forming of droplets in gases and their motion. *Phase separation of solid – liquid coarse disperse systems.* Liquid bonds in particulate materials. Solid – liquid phase separation by mechanical processes. Settling in gravitational and centrifugal fields. Filtration in gravitational and centrifugal fields and by pressure difference supplied by pumps. Solid – liquid phase separation by pressing. *Phase separation of solid – gas coarse disperse systems* in gravitational, centrifugal and electrostatic fields. Phase separation of solid – gas coarse disperse systems by the application of filtering media and the wet dust separation.
Teaching Methods	Lecture: 1 contact hour per week Seminar: 1 contact hour per week
Assessment Methods	Practical mark (exam. / pr. mark. / other) **Assessment and grading** Requirements of the practical mark: Less than 20 % class missing; Presenting the laboratory measurements reports; Writing the classroom test successfully **Assessment:** Five grades scale

	Assessment according to a five grade scale: Missing basic knowledge – unacceptable Student demonstrates basic knowledge – acceptable Student demonstrates basic knowledge and can apply it in practice – intermediate Student demonstrates system level knowledge in contexts – good Student demonstrates outstanding system level knowledge in contexts - excellent
Grading	88 – 100: excellent (5), 75 – 87: good (4), 63 – 74: intermediate (3), 51 – 62: acceptable (2), ≤50: unacceptable (1).
Materials/literature	Lecture notes Tarján I.: A mechanikai eljárástechnika alapjai. Miskolci Egyetemi Kiadó, 1997. Faitli J. – Mucsi G. – Gombkötő I. – Nagy S. – Antal G.: Mechanikai eljárástechnikai praktikum. Miskolci Egyetemi Kiadó, 2017. Faitli J. - Tarján I.: Mérési Gyakorlatok (A mechanikai eljárástechnika alapjai II.) Jegyzet. Miskolc, 1997. ME Eljárástechnikai Tanszék Stieβ, M: Mechanische Verfahrenstechnik 1,2. Springer (Lehrbuch) 1995. Tarján G.: Mineral Processing (Vol. 1, 2). AK. Bp.1981.
Note	Compulsory

Module Name	**Ecology and nature protection**
ECTS Credits	**3**
Responsible	Teofil Fülöp Dr., invited lecturer, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	To familiarize students with ecology, one of the bases of nature protection sciences. It is followed by laying the foundations and practicing field work introducing the living and non-living elements (objects) of nature, taking the ecological viewpoint into consideration; the work is completed by documenting its results. Emphasizing the necessity of practical activity for the students, and preparing them to use the basic nature protection approach in a creative way in their future professional activities. **Competencies to evolve (see Appendix 1):** T1, T8, T9, A1, A3, F1, F4
Contents	Objects, factors and definition of ecology. Biotic and abiotic ecological factors. Elements of the ecosystem and its greater units. Characteristics and loadibility of ecosystems. Material cycles and food chain, energy flow. The circuit of biogeochemical cycles (C, nitrogene, water, phosphor, sulphur, biogenic elements). Anthropogenic effects and their roles. The relationship system of ecology and nature protection (nature conversation). Connection of nature protection (nature conversation) to environmental protection, complementing each other. Elements and tasks of nature protection. Emphasizin mind shaping, presentation and research activities among the practice-centred ecological-nature protection tasks. The organizations of the Hungarian and international nature protection. International nature protection values in Hungary. International law of nature protection, the system of Hungarian nature protection laws. Legal and economics connections of nature protection.
Teaching Methods	Lecture: 1 contact hour per week

	Seminar: 2 contact hours per week
Assessment Methods	**pr. mark** **Assessment and grading:** **Signature:** Participation in lessons and field trips. **Grade:** nature protection description of a certain area (course) during the semester. Assessments (tests, exam, documentation, etc.).
Grading	> 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.
Materials/literature	Michael Begon, John L. Harper, Colin R. Townsend: ECOLOGY. Individuals, Populations and Communities. Second Edition. Blackwell Scientific Publications, 1990. Scott Ferson and Mark Burgman (Eds.): Quantitative Methods for Conservation Biology. Springer, 2002, 322 p. Malcolm Hunter and James Gibbs: Fundamentals of Conservation Biology - 3rd Edition. Blackwell Publishers, 2006, 497 p. Richard B Primack: Essentials of Conservation Biology - sixth edition. Sinauer Associates, 2014, 603 p. Stephen B Glass, Evelyn A Howell and John A Harrington: Introduction to Restoration Ecology. Island Press, USA, 2011, 464 p.
Note	Compulsory

Module Name	**Mineralogy - geochemistry**
ECTS Credits	**4**
Responsible	Sándor Szakáll Dr, associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	Students will get the knowledge of the principals of the distribution of chemical element in the Earth. They will also know the most important thermodynamic processes concerning solid materials, the geochemical classification of elements, the geochemical aspects of the genesis of the most important minerals and mineral assemblages. The geochemistry of isotopes, which explores the chemical evolution of the Earth will also be introduced, as well as the geochemical characteristics of water, organic matter, magmatic, sedimentary and metamorphic rocks by which we can describe the mineral- and rock-forming processes in the crust and mantle. **Competencies to evolve (see Appendix 1):** T1, T2, K6, K7, F1, F4
Contents	Abundance of chemical elements. Meteorites. Geochemical classification of elements. Chemical composition of Earth. Chemical composition of minerals. Genetic charateristics of mineral parageneses. Isotopes and the Periodic Table. Radioactivity and geochronology. Stable isotopes and geology. Short thermodynamics. Water chemistry. Characteristics of natural water. Geochemistry of soils. Organic geochemistry. Organic geochemistry of freshwater and seawater. Geochemistry of sedimentary rocks. Chemical weathering. Geochemistry of igneous and metamorphic rocks.

	Practical work: self-made solutions of simple case-study problems.
Teaching Methods	Lecture: 2 contact hours per week Seminar: 1 contact hour per week
Assessment Methods	**oral/written exam** Students will be assessed with using the following elements. Attendance 15 % Individual report 10 % Midterm exam 40 % Final exam 35 % Total 100%
Grading	Grading scale: % value Grade 90 -100% 5 (excellent) 80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)
Materials/literature	Albared, F. (2005): Geochemistry. An introduction. Cambridge Univ. Press. John W. Anthony, Richard A. Bideaux, Kenneth W. Bladh, and Monte C. Nichols, Eds. (2003): Handbook of Mineralogy. Mineralogical Society of America. Brownlow, A. H. (1996): Geochemistry. Prentice Hall, New Jersey.
Note	Compulsory

Module Name	**Soil chemistry**
ECTS Credits	**3**
Responsible	János Lakatos Dr., associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	To highlight the colloidal, and chemical structure of the soil, the main equilibriums take place in the soil and which has govern the possible transformation of inorganic and organic substances are present or placed into the soil. The goal is to provide a skill to solve the environmental protection problems related to the soils. **Competencies to evolve (see Appendix 1):** T1, T2, T3, K6, K7, F1, F4
Contents	Definition and classification of soils. Characterization of the solid, solution and gas phase of the soils. Sorption, dissolution, acid-base equilibriums in the soils. Red-ox reactions. Inorganic and organic substance transformation in the soil environment. Contamination of soils and remediation possibilities. Importance of soil protection.
Teaching Methods	Lectures: 2 contact hours per week Seminars: 1 contact hour per week Oral lectures with slides, five 2 h laboratory practice focused to investigate the structure and composition of the soils (Study the soil suspensions, humidity, organic content determination of soils, investigation of acid-base character and buffer capacity of soils, preparation and investigation of soil extracts).

Pre-requisites	AKKEM 6003 equivalent
Assessment Methods	During the semester the following tasks should be completed: take part the lecture min 60%, Fulfil the laboratory practice work. One missing is allowed. Answer the minimum questions properly min. 50 %, must be correct. Writing the the test from the subject of lecture. Mark: (final test mark 2x + lab practice mark 1x)/3
Grading	> 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.
Materials/literature	D. L. Sparks: Environmental Soil Chemistry, Acad. Press, London (2002). Elsevier BV, ISBN: 978-0-12-656446-4 B. Yaron, R. Calvet, R. Prost: Soil pollution, Springer, (1996). M.R. Ashaman and G. Puri: Essential Soil science, Blackwell Publ,(2002.) Kim H. Tan : Principles of Soil Chemitry, CRC Press, (1998) Hinrich L. Bohn, Rick A. Myer, George A. O'Connor: Soil Chemistry, 2nd Edition, ISBN: 978-0-471-27497-1, E book, Wiley (2002).
Note	Compulsory

Module Name	**Environmental and Waste Management Law**
ECTS Credits	**2**
Responsible	Ede János Szilágyi Dr., habilitated associate professor, PhD
Duration	3rd semester
Teaching Language	English
Learning Outcome (Competencies)	Students awareness of the environmental assessment procedures, the methods can be used to make the study. **Competencies to evolve (see Appendix 1):** T1, T6, K3, A2, F1, F2, F4, F5, F6
Contents	1. A brief introduction to law I. 2. A brief introduction to law II. 3. The concept of sustainable development 4. The development, the subject and the system of environmental law 5. The sources and the methods of environmental law 6. International environmental law I 7. International environmental law II 8. The EU's environmental law I 9. The EU's environmental law II 10. Constitutional aspects of environmental law 11. Waste management law I 12. Waste management law II 13. The presentation of the course participants I 14. The presentation of the course participants II 15. The presentation of the course participants III
Teaching Methods	Lectures: 2 contact hours per week
Assessment Methods	**exam.**

	The examination includes: a, an oral presentation on a topical issue of environmental law and b, a written exam. The presence is compulsory on the course.
Grading	> 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.
Materials/literature	Bell, Stuart – McGillivray, Donald – Pedersen, Ole.: Environmental law, Oxford, Oxford University Press, 2013 Krämer, Ludwig: EU environmental law, London, Sweet & Maxwell, 2012 Kubasek, Nancy – Silverman, Gary: Environmental law, Boston [etc.], Pearson, 2014 Raisz Anikó: A Constitution's Environment, Est Europa, 2012/special edition 1, pp 37-70
Note	Compulsory

Module Name	**Methods of environmental assessment**
ECTS Credits	**2**
Responsible	Balázs Zákányi Dr., assistant professor
Duration	3rd semester
Teaching Language	English
Learning Outcome (Competencies)	Students awareness of the environmental assessment procedures, the methods can be used to make the study. **Competencies to evolve (see Appendix 1):** T1, T2, K3, K7, K9, A5, A6, A7, F1, F2, F4, F5, F6
Contents	The history of environmental impact assessment. The legal regulation of the environmental impact assessment. Environmental assessment, environmental impact assessment, uniform environmental permit. The qualification of environmental test activities can be combined with the functionality and connectivity of the procedures. The phases of environmental testing, the method of the official method. The preliminary environmental study. The detailed requirements for environmental compatibility studies. Acting factors stakeholders, impact processes, the spread effects. The effect areas, control areas. The main aspects of recruitment procedures and environmental standards. In the effectiveness test methods and procedures. Impact Assessment. Monitoring. The impact assessment public of the hearing, public hearing. Analysis of practical examples. Preparation of an impact test, study management, presentation, public discussions. Practical work: self-made solutions of simple case-study problems.
Teaching Methods	Seminars: 2 contact hours per week
Assessment Methods	**pr. mark** Students will be assessed with using the following elements. Attendance: 15 %

	Individual report 40 % MFinal exam 55 % Total 100%
Grading	% value Grade 90 -100% 5 (excellent) 80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)
Materials/literature	Charles H. Eccleston: Environmental Impact Assessment: A Guide to Best Professional Practices. CRC Press, 2011 John Glasson: Methods of Environmental Impact Assessment. Routledge, 2009. M. Schmidt, J. Glasson, L. Emmelin, H. Helbron: Standards and Thresholds for Impact Assessment Springer, 2008. EU directives
Note	Compulsory

Module Name	**Basics of waste management**
ECTS Credits	**3**
Responsible	Gábor Mucsi Dr., associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	Students will know the fundamentals of waste management and the generation of wastes. Furthermore, they will be able to characterize – from process engineering and chemical point of view – and utilize the various wastes. **Competencies to evolve (see Appendix 1):** T1, T2, T4, A,1 A2, F1, F3, F4
Contents	The aim of the subject for students is to learn knowledge about the waste management. History and development of waste management. Generation and types of industrial and municipal wastes. Introduction, position and aim of the subject in the course. Generation, types, composition, environmental effect of wastes. Definition and basics of sustainable development and sustainable raw material management. Determination of material characteristics (chemical and physical properties) and evaluation of the results. Material flow of production and consumption wastes. Relationship of waste management and environmental protection. Product and production integrated environmental protection. Treatment and preparation of wastes based on various utilization needs. Processes of mechanical waste preparation. General waste preparation technologies.
Teaching Methods	Lectures: 2 contact hours per week Seminars: 1 contact hour per week
Assessment Methods	**exam.** Students will be assessed with using the following elements. Attendance: 5 % Homework: 10 % Short quizzes: 10 %

	Midterm exam: 40 % Final exam: 35 % Total: 100%
Grading	Grading scale: % value Grade 90 -100% 5 (excellent) 80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)
Materials/literature	Bernd Bilitewski: Waste management. 1997. Springer Science & Business Media Jacqueline Vaughn: Waste Management: A Reference Handbook. 2009 Ramesha Chandrappa: Solid Waste Management: Principles and Practice. 2012. Springer Lecture PowerPoint
Note	Compulsory

Module Name	**Waste incineration, air quality control**
ECTS Credits	**4**
Responsible	Arnold András Kállay Dr., assistant professor, PhD
Duration	3rd semester
Teaching Language	English
Learning Outcome (Competencies)	**Competencies to evolve (see Appendix 1):** T1, T2, T3, T4, K6, K7, K9, K13, K14, A1, A2, A3, A4, F1, F4
Contents	1.) Flow diagram of waste processing; basic regulations for thermal treatment and disposal. 2.) Combustion parameters of wastes: physical state (solid, liquid, gaseous), particle composition, density, moisture and ash content; chemical composition (C, H. N, S, Cl), calorific value. 3.) Calculation of combustion parameters: the chemical reactions of combustion, minimum oxigen and air requirement of fules, optimal air excess necessary for complete combustion. 4.) Gaseous wastes, normal burning velocity of fuels, flame velocity, flammability and explosion limits, operating conditions for safe combustion; methods for flame stabilization. 5.) Flame and flue gas characteristics: specific volume, chemical composition, specific heat capacity; combustion temperature (theoretical and actual), dissociation and adiabatic flame temperature (definition, calculation methods); methods for increasing/reducing combustion temperature. 6.) Technical parameters of waste incineration, auto-ignition range; grid types and grid structures, combustion chamber geometry, the construction of refractory walls (design and structure). 7.) Hazardous waste disposal (by incineration), required minimum incineration temperature, the thermal treatment of halogenated waste, present-day waste incinerators, determination of post-combustion chamber (’afterburners’).

	8.) Characterization of solid combustion residues: physical-chemical properties, mineral composition, thermal behaviour, sintering and ash fusion characteristics, melting temperature. Treatment and disposal of slags and fly ash. 9.) Burners: classification, geometry, sizing, fuel injection by spray nozzles (oil burners). 10.) Air pollution control: regulatory measures and provisions for waste incineration; possible allowed emission and emission concentrations (EU target values). 11.) Gaseous pollutants: CO, radicals, sulphur oxides, NOx formation (conditions, intensity), primary reduction methods, determination of gas emission concentrations. 12.) Characterization of gaseous pollutants; options for secondary emission reduction; flue gas cleaning methods and equipment. 13.) Definition of dust (for environmental regulations), properties of particulate matter (PM), separation and collection mechanisms, design and operation of dust collection systems (separators). Practical work: self-made solutions of simple case-study problems.
Teaching Methods	Lectures: 2 contact hours per week Seminars: 1 contact hour per week
Assessment Methods	**Exam** Students will be assessed with using the following elements. Attendance: 15 % Individual report 10 % Midterm exam 40 % Final exam 35 % Total 100%
Grading	> 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.
Materials/literature	C. Baukal Jr.: Industrial Combustion Pollution and Control, Oklahoma, 2004, ISBN 0-8247-4694-5 M. Döing: Waste to Energy, Cologne, http://www.ecoprog.com, 2014 Godfrey Boyle: Renewle Energy, Oxford, 2004, ISBN 0-19-926178-4
Note	compulsory

Module Name	**Water and waste water treatment**
ECTS Credits	**2**
Responsible	Sándor Nagy Dr., associate professor, PhD
Lecturer(s)	Valéria Üveges Dr. Mádainé, assistant lecturer
Duration	3rd semester
Teaching Language	English
Learning Outcome (Competencies)	The students will be familiar with the basic elements and concepts of modern water and waste water purification technology and processes. The students will

	be able to choose the right purification technology concerning environmental protection aspects. **Competencies to evolve (see Appendix 1):** T1, T3, K6, K8, K10, A1, A2, A4, F1, F4
Contents	Contamination and pollution processes in water. Pollution limits in water and in groundwater. The most typical contaminants and their physical and chemical properties. Sampling, and preparations of samples. Cleaning and purification technology for municipal and industrial waste water. Technology design.
Teaching Methods	Lectures: 1 contact hour per week Seminars: 1 contact hour per week
Pre-requisites	Water quality protection
Assessment Methods	**pr. mark** Students will be assessed with using the following elements. Attendance: 15 % Short quizzes 10 % Midterm exam 40 % Final exam 35 % Total 100%
Grading	% value Grade 90 -100% 5 (excellent) 80 – 89% 4 (good) 70 - 79% 3 (satisfactory) 60 - 69% 2 (pass) 0 - 59% 1 (failed)
Materials/literature	Klaus Görner- Kurt Hübner: Gewaesserschutz und Abwasserbehandlung; Springer-Verlag Berlin heidelberg, 2002. M Henze; P Harremoes; J la C Jansen; E Arvin: Wastewater Treatment; Springer-Verlag Berlin heidelberg, 2002 M. Sperling: Biological Wastewater Treatment Series (Volume two): Basic Principles of Wastewater Treatment, IWA 2007 R. Ramalho: Introduction to Wastewater Treatment Processes. Academic Press, 2013
Note	compulsory

Module Name	**Handling and processing of Biodegradable Wastes**
ECTS Credits	**3**
Responsible	Ljudmilla Bokányi Dr., associate professor, PhD
Duration	1st semester
Teaching Language	English
Learning Outcome (Competencies)	To introduce the sustainable biological treatment systems for the conversion of biowastes into marketable materials or energy, or safe disposal. **Competencies to evolve (see Appendix 1):** T1, T4, K1, K2, K4, K11, A1, A3, F1, F4
Contents	Quality and quantity biowastes according to the EU List. Microbiological and thermodynamic fundamentals of aerobic and anaerobic biodegradation. Composting processing systems, technology, equipment, quality assurance and

	control. Production of biogas: technological solutions, reactors, quality assurance and control, application of biogas. Technological design and dimensioning. Economics of the technologies. Innovative biotreatment of biowastes for the sake of “green chemistry”. Sustainability and environmental aspects.
Teaching Methods	Lectures: 2 contact hours per week Seminars: 1 contact hour per week
Assessment Methods	**Exam** During the semester the following tasks should be completed: laboratory work and report, written test.
Grading	> 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.
Materials/literature	Heribert Insam, Nuntavun Riddech, Susanne Klammer Microbiology of Composting. Springer Science & Business Media, 2002. Paul T. Williams Waste Treatment and Disposal John Wiley & Sons, 2013
Note	compulsory/elective

Appendix: List of competences according to learning outcomes of the environmental engineering master programs accredited in Hungary.

Training objectives and professional competences for MSc in Environmental Engineering

The objective of the programme is to train environmental engineers who, in possession of an up-to-date knowledge of natural sciences, ecology, engineering and management, are able to identify and assess existing and potential environmental hazards, to prevent or reduce environmental damage, as well as to devise and manage damage control plans. In possession of a modern IT knowledge they are able to perform complex engineering and scientific planning and analyses using planning, modelling and simulation software. They work out and apply appropriate technological solutions to prevent environmental pollution, and they perform engineering planning and control tasks in the field of waste processing and recycling. They are able to optimise environmental protection technologies and environmental use. They are prepared to continue their studies at postgraduate level.

Professional competences to be acquired

Environmental Engineers’

a) knowledge

T1- Knowledge and application of scientific and technical theory and practice related to environmental engineering.

T2- Knowledge of measurement techniques and theories related to environmental engineering.

T3- Knowledge and application of environmental protection and remediation processes (operations, equipment, appliances), as well as damage control methods.

T4- Knowledge of the operation and equipment of environmental protection facilities (especially water and waste water treatment plants, hazardous and municipal landfills, waste incineration plants), and their development opportunities.

T5- Knowledge and application of the rules of environmental impact assessment and technical documentation for environmental protection.

T6- Knowledge of the organisational and motivational tools related to management, and the regulations necessary to pursue the profession.

T7- Knowledge and complex application of the methodology and modelling of environmental informatics.

T8- Knowledge of the basics, limits and requirements of occupational and fire safety, industrial safety, information technology, law and economics.

T9- Knowledge of the methods how to promote and shape opinions on environmental engineering activities.

b) skills

K1- Knowledge of general and specific principles, rules, relations and procedures pertaining to mathematics, natural and social sciences to solve problems arising in the field of environmental protection.

K2- Ability to publish research work and hold discussions in their field in their mother tongue and at least in one foreign language.

K3- Ability to perform managerial tasks in environmental protection.

K4- Ability to perform tasks in international and transboundary projects, as well as to present their research findings and design documentations at social and professional forums.

K5- Examining the opportunities of setting research, development and innovation objectives and striving to achieve them during their work.

K6- Ability to plan, implement, and maintain complex engineering interventions arising in soil, geological formation, water, air, vibration and noise and wildlife protection, as well as remediation and waste minimisation, treatment and processing.

K7- Ability to plan and perform environmental sampling, to perform comprehensive laboratory testing and analysis, to apply monitoring systems, to evaluate and document test results.

K8- Ability to apply environmental protection and damage control methods, to prepare and coordinate damage control.

K9- Ability to plan and carry out environmental impact assessment.

K10- Ability to apply integrated knowledge from the field of environmental protection equipment, processes, technologies, as well as related electronics and informatics.

K11- Ability to model, operate and manage environmental engineering systems and processes.

K12- Ability to plan, introduce and operate environmental management systems.

K13- Ability to perform energy efficiency analyses, surveys and audits, to implement measures and to support their implementation.

K14- Ability to plan and carry out complex environmental, economic and social projects.

c) attitude

A1- Openness and aptness to know, accept and credibly communicate professional and technological development and innovation in environmental engineering.

A2- Commitment to professional and ethical values related to environmental engineering.

A3- Striving to design and perform tasks individually or in a team at a professionally high level.

A4- Striving to perform work in a complex, system based and process oriented way.

A5- Striving to continuously improve their own and colleagues' knowledge through further and self-education.

A6- Committed to do high-level, high quality work, striving to communicate this attitude to their co-workers.

A7- Sharing experiences with co-workers, thus helping their development.

d) autonomy and responsibility

F1- Performing environmental engineering tasks individually, making informed decisions individually after consultations with representatives from diverse fields (primarily that of law, economics, energy management), taking responsibility for the decisions.

F2- Making decisions based on the basic requirements of occupational health and safety, technological, economic and legal regulations, as well as engineering ethics.

F3- Initiative to solve environmental problems, to reveal the faults of applied technologies, the risks of the processes and to implement measures to minimise them.

F4- Sharing acquired knowledge and experience with representatives of the field communicating in formal, non-formal and informal ways.

F5- Assessment of their subordinates' work, sharing critical comments to improve their professional development towards a responsible and ethical engineering practice.

F6- Attention to legal, technical, technological and administrative changes related to their field.