University of Debrecen
Faculty of Science and Technology
Institute of Biology and Ecology

ENVIRONMENTAL SCIENCE MSC PROGRAM

2022

TABLE OF CONTENTS

DEAN`S WELCOME

Welcome to the Faculty of Science and Technology!

This is an exciting time for you, and I encourage you to take advantage of all that the Faculty of Science and Technology UD offers you during your bachelor's or master's studies. I hope that your time here will be both academically productive and personally rewarding

Being a regional centre for research, development and innovation, our Faculty has always regarded training highly qualified professionals as a priority. Since the establishment of the Faculty in 1949, we have traditionally been teaching and working in all aspects of Science and have been preparing students for the challenges of teaching. Our internationally renowned research teams guarantee that all students gain a high quality of expertise and knowledge. Students can also take part in research and development work, guided by professors with vast international experience.

While proud of our traditions, we seek continuous improvement, keeping in tune with the challenges of the modern age. To meet the demand of the job market for professionals, we offer engineering courses with a strong scientific basis, thus expanding our training spectrum in the field of technology. Based on the fruitful collaboration with our industrial partners, recently, we successfully introduced dual-track training programmes in our constantly evolving engineering courses.

We are committed to providing our students with valuable knowledge and professional work experience, so that they can enter the job market with competitive degrees. To ensure this, we maintain a close relationship with the most important national and international companies. The basis for our network of industrial relationships are in our off-site departments at various different companies, through which market participants - future employers - are also included in the development and training of our students.

Prof. dr. Ferenc Kun
Dean

UNIVERSITY OF DEBRECEN

Date of foundation: 1912 Hungarian Royal University of Sciences, 2000 University of Debrecen

Legal predecessors: Debrecen University of Agricultural Sciences; Debrecen Medical University; Wargha István College of Education, Hajdúböszörmény; Kossuth Lajos University of Arts and Sciences

Legal status of the University of Debrecen: state university

Founder of the University of Debrecen: Hungarian State Parliament

Supervisory body of the University of Debrecen: Ministry of Education

Number of Faculties at the University of Debrecen: 14

Faculty of Agricultural and Food Sciences and Environmental Management

Faculty of Child and Special Needs Education

Faculty of Dentistry

Faculty of Economics and Business

Faculty of Engineering

Faculty of Health

Faculty of Humanities

Faculty of Informatics

Faculty of Law

Faculty of Medicine

Faculty of Music

Faculty of Pharmacy

Faculty of Public Health

Faculty of Science and Technology

Number of students at the University of Debrecen: 29,954

Full time teachers of the University of Debrecen: 1,557

197 full university professors and 1,224 lecturers with a PhD.

FACULTY OF SCIENCE AND TECHNOLOGY

The Faculty of Science and Technology is currently one of the largest faculties of the University of Debrecen with about 3000 students and more than 200 staff members. The Faculty has got 6 institutes: Institute of Biology and Ecology, Institute of Biotechnology, Institute of Chemistry, Institute of Earth Sciences, Institute of Physics and Institute of Mathematics. The Faculty has a very wide scope of education dominated by science and technology (11 Bachelor programs and 13 Master programs), additionally it has a significant variety of teachers' training programs. Our teaching activities are based on a strong academic and industrial background, where highly qualified teachers with a scientific degree involve student in research and development projects as part of their curriculum. We are proud of our scientific excellence and of the application-oriented teaching programs with a strong industrial support. The number of international students of our faculty is continuously growing (currently 770 students). The attractiveness of our education is indicated by the popularity of the Faculty in terms of incoming Erasmus students, as well.

THE ORGANIZATIONAL STRUCTURE OF THE FACULTY

Dean: Prof. Dr. Ferenc Kun, Full Professor
E-mail: ttkdekan@science.unideb.hu

Vice Dean for Educational Affairs: Prof. Dr. Gábor Kozma, Full Professor
E-mail: kozma.gabor@science.unideb.hu

Vice Dean for Scientific Affairs: Prof. Dr. Sándor Kéki, Full Professor
E-mail: keki.sandor@science.unideb.hu

Consultant on External Relationships: Prof. Dr. Attila Bérczes, Full Professor
E-mail: berczesa@science.unideb.hu

Consultant on Talent Management Programme: Prof. dr. Tibor Magura, Full Professor
E-mail: magura.tibor@science.unideb.hu

Dean's Office
Head of Dean's Office: Mrs. Katalin Kozma-Tóth
E-mail: toth.katalin@science.unideb.hu

English Program Officer: Mr. Imre Varga – Applied Mathematics (MSc), Chemical Engineering (BSc/MSc), Chemistry (BSc/MSc), Earth Sciences (BSc), Electrical Engineering (BSc), Geography (BSc/MSc), Mathematics (BSc), Physics (BSc), Physicist (MSc), International Foundation Year, Intensive Foundation Semester
Address: 4032 Egyetem tér 1., Chemistry Building, A/101, E-mail: vargaimre@unideb.hu

English Program Officer: Mrs. Szilvia Gyulainé Szemerédi – Biochemical Engineering (BSc), Biology (BSc/MSc), Environmental Science (MSc), Hidrobiology Water Quality Management (MSc)
Address: 4032 Egyetem tér 1., Chemistry Building, A/104,
E-mail: szemeredi.szilvia@science.unideb.hu

DEPARTMENTS OF THE INSTITUTE OF BIOLOGY AND ECOLOGY

Department of Ecology (home page: http://ecology.science.unideb.hu/)
4032 Debrecen, Egyetem tér 1, Ecology Building

Name	Position	E-mail	room
Mr. Prof. Dr. Béla Tóthmérész, PhD, habil, DSc	University Professor, Head of Department	tothmeresz.bela@science.unideb.hu	112
Mr. Prof. Dr. Tibor Magura, PhD, habil, DSc	University Professor	magura.tibor@science.unideb.hu	104
Ms. Dr. Edina Simon-Kundrát, PhD, habil	Associate Professor	simon.edina@science.unideb.hu	103
Mr. Dr. Péter Török, PhD, habil, DSc	University Professor	torok.peter@science.unideb.hu	019
Mr. Dr. Roland Horváth, PhD, habil	Assistant Professor	horvath.roland@science.unideb.hu	003

Department of Hydrology (home page: http://hidrobiologia.unideb.hu/)
4032 Debrecen, Egyetem tér 1, Ecology Building

Name	Position	E-mail	room
Mr. Dr. István Grigorszky, PhD, habil	Associate Professor, Head of Department	grigorszky.istvan@science.unideb.hu	023
Mr. Dr. István Bácsi, PhD, habil	Associate Professor	bacsi.istvan@science.unideb.hu	020
Mr. Dr. István Gyulai, PhD	Assistant Professor	gyulai.istván@science.unideb.hu	006
Mr. Csaba Berta, PhD	Research Assistant fellow	berta.csaba@science.unideb.hu	120

Department of Evolutionary Zoology (home page: http://www.zool.klte.hu/)
4032 Debrecen, Egyetem tér 1, Life Science Building

Name	Position	E-mail	room
Mr. Dr. Zoltán Németh, PhD	Assistant Professor	nemethzoltan@science.unideb.hu	1.201
Mr. Dr. Jácint, PhD	Associate Professor	tokolyi.jacint@science.unideb.hu	1.047

DEPARTMENT OF THE INSTITUTE OF EARTH SCIENCES

Department of Physical Geography and Geoinformatics (home page: https://sketchfab.com/geogis)
4032 Debrecen, Egyetem tér 1, Geomathematics Building

Name	Position	E-mail	room
Mr. Prof. Dr. Szilárd Szabó, PhD, habil, DSc	University Professor, Head of Department	szabo.szilard@science.unideb.hu	223
Mr. Dr. Négyesi Gábor, PhD	Assistant Professor	negyesi.gabor@science.unideb.hu	228

ACADEMIC CALENDAR

General structure of the academic semester (2 semesters/year):

Study period	1st week	Registration*	1 week
	2nd – 15th week	Teaching period	14 weeks
Exam period	directly after the study period	Exams	7 weeks

*Usually, registration is scheduled for the first week of September in the fall semester, and for the first week of February in the spring semester.

For further information please check the following link:

https://www.edu.unideb.hu/tartalom/downloads/University_Calendars_2022_23/University_calendar_2022-2023-Faculty_of_Science_and_Technology.pdf

THE ENVIRONMENTAL SCIENCE MASTER PROGRAM

Information about the Program

Name of MSc Program:	Environmental Science MSc Program
Specialization available:	Ecology, environmental and nature conservation
Field, branch:	Science
Qualification:	Environmental Scientist
Mode of attendance:	Full-time
Faculty, Institute:	Faculty of Science and Technology Institute of Biology and Ecology
Program coordinators:	Dr. Péter Török, Full Professor Dr. Edina Kundrát-Simon, Associate Professor
Duration:	4 semesters
ECTS Credits:	120

Objectives of the MSc program:

The aim of the Environmental Science MSc program is to train professional scientists who have deep insight into environmental processes. Relying on strong biology, ecology, hidrology and geography base graduates of the program are able to understand the complex environmental phenomena and to develop applied science-based solutions.

Professional competences to be acquired

Environmental Scientist:

a) Knowledge:

- He/she has a designer and management level knowledge of the theories, paradigms, ideas and principles of environmental sciences.
- He/she has basic knowledge about biology, physics, geological sciences, chemistry, mathematics and informatics which is necessary to work effectively in such a multi-disciplinary field of science as environmental sciences.
- He/she has knowledge of the possibilities regarding the utilisation and protection of resources on the Earth's surface or near to the Earth's surface.
- He/she has knowledge of the spatial relations of the environmental processes on micro-, meso- and macro-region levels.
- He/she has a knowledge of the analysis of the solid, liquid and gas components of organic and inorganic samples from natural and artificial environments. Able to analyse the composition, structure and the distribution of the samples.

- He/she has a knowledge and a critical approach regarding the effects of medical, judicial and safety regulations on the environment and on the society.
- He/she has a knowledge of the collection (both field and laboratory), processing and interpretation of data from organic and inorganic materials.
- He/she has a knowledge of the special methodology, planning and data interpretation for the basic and applied researches in the field of environmental and nature protection.
- He/she has a knowledge on the management level solutions for problems occurring in the fields of environmental protection, nature conservation, industrial, medical and self-government.

b) Abilities:
- He/she is able to critically evaluate theories and principles in the light of the changing natural environment and social environment.
- He/she is able to harmonise field and laboratory perceptions with theory through the workflow of observation, recognition, synthesis and modelling.
- Through multidisciplinary thinking, he/she is able to understand the direct and indirect relationships of environmental science using the information available from the subdisciplines of environmental science.
- He/she is able to recognise and identify the properties of the materials and phenomena involved in environmental science, and able to characterise them by the measures of environmental science both in the nm and km size range, both in space and time.
- He/she is able to perform field and laboratory environmental studies with regard to risk assessment, access rights, appropriate health and safety regulations.
- He/she is able to design, direct and manage data collection, data capture and processing that can be used for biotic and abiotic environmental patterns. He/she is able to handle errors in data collection.
- He/she is able to set up and control data sampling and data evaluation of biotic and abiotic environmental data. He/she is able to deal with the possible faults in data management and able to set up management level hypotheses.
- He/she is able to apply the special IT and info-communication methods required for field and laboratory data collection, data recording and processing, and data interpretation of organic and inorganic substances in our environment.
- He/she is able to work independently as a designer, manager and expert in workplaces dealing with scientific research in environment and nature conservation. He/she is able to work effectively in workplaces adapting the results of environmental sciences such as research institutes and administration.
- He/she is able to design, organize, carry out researches, and produce research reports, including the use of received data.
- He/she is able to engage in the tasks of industry, agriculture and forestry, water, health, and local government.
- He/she is able to independently solve tasks requiring environmental education in nature and environment.
- He/she is able to design and implement environmental impact assessments and evaluate the results in accordance with domestic and EU requirements and standards.
- He/she has a wide range of problem-solving skills set by environmental problems.
- He/she is able to interpret articles in a foreign language, which is related to the field of environmental science and able to process it on an independently elaborated basis.

c) Attitude:
- He/she is positively interested in continuative education in environmental science.
- He/she makes efforts to reach the widest possible understanding of processes in the spheres located on the Earth's surface or near its surface.

- He/she makes efforts to get acquainted with the new achievements of the disciplines of environmental science and to synthesize them.
- He/she has the necessary abilities for designing, conducting and evaluating practical activities related to the examination of each sphere.
- He/she makes efforts to carry out its tasks related to environmental problems in co-operation with his/hers colleagues, taking into account their professional opinion.
- He/she makes efforts to develop co-operation with representatives of other scientific fields in environmental studies.
- He/she is sensitive to the environmental and natural problems and crises both on a local and global scale.
- He/she has environmental awareness, love of nature, and commitment to the sustainable development which guides and shapes his/hers lifestyle and actions.

d) Autonomy and responsibility:
- By his/hers initiatory and decision-making ability. along with personal responsibility, he/she is able to create a constructive co-operation in teamwork, and even manage teams.
- He/she takes responsibility for his/her decisions regarding environmental issues.
- During professional activities, he/she studies with responsibility the environmental risks of anthropogenic processes and, according to his/her best knowledge, directs the necessary actions to reduce them.
- He/she can independently evaluate the professional literature related to any field of environmental science, even in a foreign language.
- He/she independently carries out practical research tasks related to any field of the environment and takes responsibility for them.
- He/she can carry out independent planning, management and expert tasks in workplaces for scientific research in environmental sciences, in research and development institutes and in the administration of environmental sciences.

Completion of the MSc Program

The Credit System

Majors in the Hungarian Education System have generally been instituted and ruled by the Act of Parliament under the Higher Education Act. The higher education system meets the qualifications of the Bologna Process that defines the qualifications in terms of learning outcomes: statements of what students know and can do on completing their degrees. In describing the cycles, the framework uses the European Credit Transfer and Accumulation System (ECTS).
ECTS was developed as an instrument of improving academic recognition throughout the European Universities by means of effective and general mechanisms. ECTS serves as a model of academic recognition, as it provides greater transparency of study programs and student achievement. ECTS in no way regulates the content, structure and/or equivalence of study programs.
Regarding each major the Higher Education Act prescribes which professional fields define a certain training program. It contains the proportion of the subject groups: natural sciences, economics and humanities, subject-related subjects and differentiated field-specific subjects.

During the program students have to complete a total amount of 120 credit points. It means approximately 30 credits per semester. The curriculum contains the list of subjects (with credit points) and the recommended order of completing subjects which takes into account the prerequisite(s) of each subject. You can find the recommended list of subjects/semesters in chapter “Model Curriculum of Environmental Science MSc Program”.

Knowledge elements, lectures and lecturers	semesters				ECTS credit points	evaluation
	1.	2.	3.	4.		
	contact hours, types of teaching (l – lecture, s – seminar, p – practice), credit points					
Basic knowledge elements						
Environmental informatics, physics, chemistry and climatology knowledge element subject group						
Environmental- and geoinformatics (Szabó Szilárd)		28 l/ 2cr. 14 p/ 1cr.			2+1	exam, mid-semester grade
Physical and chemical properties of water I (Bácsi István)	28 l/2 cr.				2	exam
Physical and chemical properties of water II (Bácsi István)	14 p/1 cr.				1	mid-semester grade
Climate change and global environmental problems (Horváth Roland		28 s/2 cr.			2	mid-semester grade
Ecology and biodiversity knowledge element subject group						
Applied ecology (Horváth Roland)	14 l/1 cr.				1	exam
Biodiversity (Tóthmérész Béla)	28 l/2 cr. 14 p/1 cr.				2+1	exam, mid-semester grade
Basics of terrestrial and soil ecology (Kundrát-Simon Edina)	28 l/2 cr. 14 p/1 cr.				2+1	exam, mid-semester grade
Soil protection and soil biota (Horváth Roland)	14 l/1 cr. 14 p/1 cr.				1+1	exam, mid-semester grade
Hydrobiology and wetland ecology (Grigorszky István.)			28 l/2 cr. 14 p/1 cr.		2+1	exam, mid-semester grade
Environmental technology and management knowledge element subject group						
Field sampling techniques in environmental sciences (Török Péter)			28 p/ 2 cr.		2	mid-semester grade
Field ecology and environmental conservation practice (Horváth Roland)		40 p/4 cr.			4	mid-semester grade

Environmental problems and rehabilitation (Török Péter)	28 l/2 cr. 14 s/1 cr.				2+1	exam, mid-semester grade
Environmental technology and ecotoxicology (Kundrát-Simon Edina)				14 l/1 cr. 28 p/2 cr.	1+2	exam, mid-semester grade
Landscape, air and water protection knowledge element subject group						
Terrestrial ecosystems and landscape protection (Tóthmérész Béla)		28 l/2 cr. 14 s/1 cr.			2+1	exam, mid-semester grade
Air pollution and environmental conservation (Kundrát-Simon Edina)		28 l/2 cr. 14 s/1 cr.			2+1	exam, mid-semester grade
Aquatic environmental and nature conservation (Gyulai István)		28 l/2 cr. 14 s/1 cr.			2+1	exam, mid-semester grade
Environmental policy and communication knowledge element subject group						
Environmental policy and communication (Török Péter)		14 l/ 1 cr. 28 p/2 cr.			1+2	exam, mid-semester grade
Environmental communication, and use of scientific databases (Gyulai István, Berta Csaba))			28 p/3 cr.		3	mid-semester grade

Differentiated professional skills
Ecology, environmental and nature conservation specialisation

Environmental modelling and analysis knowledge element subject group						
Environmental modelling (Tóthmérész Béla)	28 l/2 cr. 14 s/1 cr.				2+1	exam, mid-semester grade
Biostatistics (Tóthmérész Béla)	28 l/2 cr. 14 s/1 cr.				2+1	exam, midsemester grade
Biogeography (Négyesi Gábor)			28 l/2 cr.		2	exam

Behaviour and evolution in urban environments (Németh Zoltán)	56 s/4 cr.				4	mid-semester grade
Ecological background of environmental conservation knowledge element subject group						
Community ecology and soil protection (Horváth Roland)				28 l/2 cr. 14 s/1 cr.	2+1	exam, mid-semester grade
River ecology (Grigorszky István)			28 l/2 cr. 14 g/1 cr.		2+1	exam, mid-semester grade
Lake ecology (Grigorszky István)			28 l/2 cr. 14 g/1 cr.		2+1	exam, mid-semester grade
Evolutionary biology (Tökölyi Jácint)			42 s/3 cr.		3	mid-semester grade
Nature conservation knowledge element subject group						
Grassland ecology (Török Péter)	28 l/2 cr. 14 s/1 cr.				2+1	exam, mid-semester grade
Project and grant proposal writing (Török Péter))				14/ 1 cr. 28 p/ 2cr.	1+2	exam, mid-semester grade
Diploma thesis			210 hours consultation/15 cr.	210 hours consultation/15 cr.	30 cr	mid-semester grade
freely chosen courses						
					6 cr	exam, mid-semester grade
Internship						
			6 week/240 hours		6 cr	mid-semester grade

Work and Fire Safety Course

According to the Rules and Regulations of University of Debrecen a student has to complete the online course for work and fire safety. Registration for the course and completion are necessary for graduation. For MSc students the course is only necessary only if BSc diploma has been awarded outside of the University of Debrecen.
Registration in the Neptun system by the subject: MUNKAVEDELEM
Students have to read an online material until the end to get the signature on Neptun for the completion of the course. The link of the online course is available on webpage of the Faculty.

Internship

Students majoring in the Environmental Science MSc have to take part in a 6 weeks internship involved in the model curriculum. The internship course must be signed up previously via the NEPTUN study registration system in the spring semester (2nd semester). Achievement of the internship is the criteria requirement of getting the pre-degree certificate (absolutorium).

Objective of the internship, competences
Student becomes acquainted with the structure, operation, environmental and nature protection problems and their possible solutions at a freely chosen training organisation (governmental institution or a company). During the professional practice the student should take part in the professional work in the organisation. Professional competences: applying the professional skill gained during the training and acquiring new knowledge.

Places suitable for internship
All the organizations, institutions and companies in Hungary or abroad are suitable which are related to environmental issues. Students can freely choose the training organisation where they fulfil their professional practice, the University of Debrecen does not make a contract with potential training organisations. The institute in which the student aims to spend his/her professional practice should be confirmed by the responsible person at the University. The professional practice is based on a training plan approved by the responsible person at the University, the training institution's principal and by the student. The training institution provides the resources and conditions required for the implementation of the training plan as well as the supervisor who supervises and directs the work of the student. The responsible person at the University can check the student's work at the practice site.

Physical Education

According to the Rules and Regulations of University of Debrecen a student has to complete Physical Education courses at least in one semester during his/her Master's training. Our University offers a wide range of facilities to complete them. Further information is available from the Sport Centre of the University, its website: http://sportsci.unideb.hu.

Pre-degree Certification

A pre-degree certificate is issued by the Faculty after completion of the master's (MSc) program. The pre-degree certificate can be issued if the student has successfully completed the study and exam requirements as set out in the curriculum, the requirements relating to Physical Education, the internship (mandatory) – with the exception of preparing thesis – and gained the necessary credit points (120). The pre-degree certificate verifies (without any mention of assessment or grades) that the student has fulfilled all the necessary study and exam requirements defined in the curriculum and the requirements for Physical Education. Students who obtained the pre-degree certificate can submit the thesis and take the final exam.

Thesis

A Thesis is the creative elaboration of a professional task in written form. By solving the task, the student relies on his/her studies using national and international literature under the guidance of an internal and external supervisor (referee). By a completed dissertation and its successful defence an environmental scientist student certifies that he/she is capable to apply the acquired knowledge in practice and to summarize the completed work and its results in a professional way, to solve the tasks related to his/her topic creatively and to complete individual professional work. By preparing and defending a thesis a student who completes the Environmental Science Master Program proves that he/she is capable of the practical applications of the acquired skills, summarizing the work done and its results in a professional way, creatively solving the tasks related to the topic and doing individual professional work.
The requirements of the thesis content, the general aspects of evaluation and the number of credits assigned to the thesis are determined by the requirements of the program. In the environmental sciences program the credits assigned to the thesis is 30.

A thesis can be submitted only if it is supported both by the internal supervisor and the external referee. If a thesis is evaluated with a fail mark by the referee and the department the student is not allowed to take the final exam and is supposed to prepare a new or modified thesis. The student has to be informed about it. Conditions on resubmitting the thesis are defined by the program coordinator of the particular specialization.

Final Exam

Students had obtained the pre-degree certificate will finish their studies by taking the final exam of Environmental Science Master Program. A final exam is the evaluation and control of the knowledge and skills acquired. The candidate has to certify that he/she is able to apply the obtained knowledge in practice. A final exam can be taken in the forthcoming exam period after obtaining the pre-degree certificate. A final exam has to be taken in front of the Final Exam Board. If a candidate does not pass his/her final exam by the termination of his/her student status, he/she can take his/her final exam after the termination of the student status on any of

the final exam days of the relevant academic year according to existing requirements on the rules of the final exam.

The Final Exam consists of 3 parts on the basis of its curriculum:

According to the prerequisites of taking a final exam:

- compiling all the subjects provided from semester 1 to 4 in the model curriculum, obtaining at least 120 credits including subjects of criterion on the basis of curriculum;
- fulfilling internship in full-time programme (6 weeks);
- preparing and submitting the thesis (2 semesters, 30 credits).

The final exam (oral exam):
Subjects:
- The core material of the final exam (T1; T2)
- Material related to the 'Ecology, environmental and nature conservation' specialisation (T3)
- Grade for the thesis (D1) and grade for the thesis defence (D2)

Calculation of a final exam grade (FE) according to this formula:
FE= (T1+T2+T3+D1+D2)/5

The requirements of the oral part of the final exam, the agenda of the topics with the indication of their literature are announced by the department during the final week of the study period the latest. The oral part of the final exam is evaluated on a five-point scale by the Final Exam Board. The final grade for the final exam will be decided on by voting in a closed meeting after the final exam. In case of equal votes, the committee chair will take the decision. Final exam results will be announced by the committee chair. A note of the final exam will be taken.

Retaking failed final exam
If any parts of the final exam are evaluated with a fail mark according to the existing rules of the university, it can be retaken. The ensuing final exam period is the soonest that the re-sit is allowed. If a thesis is evaluated with a solid fail mark by the supervisor and the referee, the graduate is not allowed to take a final exam and a new thesis has to be written. A final exam can be retaken twice on each topic.

Final Exam Board
Committee chair and members of the committee are selected from the acknowledged internal and external experts of the professional field. Traditionally, it is the chair and in case of his/her absence or indisposition the vice-chair who will be called upon, as well. The committee consists of – besides the chair – at least two members, and questioners as required. The mandate of a Final Exam Board lasts for one year.

Diploma

The diploma is an official document decorated with the coat of arms of Hungary which verifies the successful completion of studies in the Environmental Science Master Program. It contains the following data: name of HEI (higher education institution); institutional identification number; serial number of diploma; name of diploma holder; date and place of his/her birth; level of qualification; training program; specialization; mode of attendance; place, day, month and year issued. Furthermore, it has to contain the rector's (or vice-rector's) original signature and the seal of HEI. The University keeps a record of the diplomas issued.

In Environmental Science Master Program the diploma grade is calculated as the average grade of the results of the followings:

- Weighted average of the overall studies at the program (A)
- Average of grades of the thesis and its defense given by the Final Exam Board (B)
- Average of the grades received at the Final Exam for the two subjects (C)

Diploma grade = (A + B + C)/3

Classification of the award on the bases of the calculated average:

Excellent	4.81 – 5.00
Very good	4.51 – 4.80
Good	3.51 – 4.50
Satisfactory	2.51 – 3.50
Pass	2.00 – 2.50

Course Descriptions of Environmental Science MSc Program

Title of course: Environmental- and geoinformatics **Code**: TTEME1001_EN / TTEML1001_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: 1 hours/week

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: -
- laboratory: 14 hours
- home assignment: 34 hours
- preparation for the exam: 14 hours

Total: 90 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Definition, function, types and content of the information systems. Geotagged information. Geoinformatics and spatial information systems. Elements of geoinformation systems. Vector and raster data models. Development of geospatial systems (cadastres, military, topography and thematic maps). Dimensions and specifications of geospatial systems; application possibilities, levels and system planning. Steps of geospatial model building. Model requirements and characteristics. Theoretical models, entities, connection types. Logical models, object characteristics, thematic and geometrical dimensions. Geometric basic shapes, scale- and resolution-dependency. Vector, raster and hybrid systems. Vector-raster and raster-vector transformation. Topological models, geometric connections of objects. Point, line and polygon topology. Data types, attributes, metadata, sampling. Geometric and attribute data collection and extraction. Theory of visual interpretation of remotely sensed data. Raster data processing techniques.

Literature

Huisman, O., de By, R.A. 2009. Principles of Geographic Information Systems. ITC Educational Textbook Series, No. 1., https://webapps.itc.utwente.nl/librarywww/papers_2009/general/PrinciplesGIS.pdf
de Smith, M.J., Goodchild, M.F., Longley, P.A. 2018. Geospatial Analysis. 6th Edition online: http://www.spatialanalysisonline.com/HTML/index.html
Graser, A. 2016. Learning QGIS, PACKT Publishing, ISBN-13: 978-1785880339

Schedule:

Lectures:

1st week Definition, function, types and content of the information systems. Geotagged information. Geoinformatics and spatial information systems.

2nd week Elements of geoinformation systems. Vector and raster data models.

3rd week Development of geospatial systems (cadastres, military, topography and thematic maps).

4th week Dimensions and specifications of geospatial systems; application possibilities, levels and system planning.

5th week Steps of geospatial model building. Model requirements and characteristics. Theoretical models, entities, connection types.

6th week Logical models, object characteristics, thematic and geometrical dimensions. Geometric basic shapes, scale- and resolution-dependency.

7th week Midterm exam (test).

8th week Vector, raster and hybrid systems. Vector-raster and raster-vector transformation.

9th week Topological models, geometric connections of objects. Point, line and polygon topology.

10th week Data types, attributes, metadata, sampling.

11th week Geometric and attribute data collection and extraction.

12th week Theory of visual interpretation of remotely sensed data

13th week Raster data processing techniques.

14th week Obligatory test, semester closing.

Practice:

1st week Introduction to GIS and the QGIS software environment.

2nd week Maps and projections - practice

3rd week Basic operations, layer management, table management.

4th week Creation of point objects.

5th week Creation of line objects.

6th week Creation of polygon objects.

7th week Thematic maps.

8th week Summary, practice.

9th week Query by attribute data.

10th week Basics of raster data, aerial and satellite images.

11th week Visual interpretation of remotely sensed data

12th week Hybrid data visualization and analysis.

13th week Practice.

14th week Obligatory test, semester closing.

Requirements:

Practice:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there is one practical test. It can be completed in the 14th week.

The minimum score is 50%. Based on the score of the test, the grade for the test is given according to the following table:

Score	Grade
0-49	fail (1)
50-59	pass (2)
60-72	satisfactory (3)
73-84	good (4)
85-100	excellent (5)

Lecture:

The minimum requirement for the examination is 50% from the midterm and closing tests. Based on the summarized score of the test the grade for the examination is given according to the following table:

Score	Grade
0-49%	fail (1)
50-59%	pass (2)
60-72%	satisfactory (3)
73-84%	good (4)
85-100%	excellent (5)

If the score of any test is below 50, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

Person responsible for course: Prof. Dr. Szilard Szabó, university professor, DSc

Lecturer: Prof. Dr. Szilard Szabó, university professor, DSc
László Bertalan, assistant lecturer

Title of course: Physical and chemical properties of water I **Code**: TTEME1005_EN	**ECTS Credit points:** 2

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: -
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The course provides knowledge on the chemical and physical properties of water. Students are introduced to the most typical processes occurring in aqueous media, and the main characteristics of aqueous solutions. The students get knowledge on the structure of the water molecule, the water phase diagram, different states (consistence, phases) and supercritical state of water, polarity, and the most typical characteristics of water as solvent. Chemical equilibrium and kinetic principles will be introduced for the acid-base reactions, complex formation, precipitation/dissolution, oxidation/reduction reactions, and for dilution processes.

Literature

- Snoeyink VL (2006) Water Chemistry. John Wiley & Sons Inc.
- Spellman FR (2014) The Science of Water: Concepts and Applications. CRC Press.
- Stanley EM (2010) Water Chemistry: Green Science and Technology of Nature's Most Renewable Resource.

Schedule:

1st week: Development of hydrophysics and hydrochemistry.

2nd week: The structure of the water molecule. General characterization and physical properties of water.

3rd week: The proportion of water resources on Earth I: Fresh, salty and brackish waters.

4th week: Proportions of water resources on Earth II .: Surface- and groundwaters.

5th week: Water cycles.

6th week: Cold and warm sea currents, the Coriolis force

7th week: Methods of measuring the physical parameters of the water, their importance in water management.

8th week: The chemical properties of water: general laws of dissolution, reactivity of water.

9th week: Water as a solvent: dissolution of gases, cations and anions.

10th week: Dissociation equilibria in aqueous solutions.

11th week: The pH of aqueous solutions.

12th week: Laws of acid-base equilibria.

13th week: Oxidation -reduction systems, basic knowledge of electrochemistry.

14th week: Organic substances in the waters, reactions of organic matter: hydrolysis, hydration, dehydration.

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there will be no written tests, there will be an oral exam in the exam period.

Person responsible for course: Dr. István Bácsi, associate professor, PhD

Lecturer: Dr. István Bácsi, associate professor, PhD

Title of course: Physical and chemical properties of water II **Code**: TTEML1005_EN	**ECTS Credit points: 1**

Type of teaching, contact hours

- lecture: -
- practice: -
- laboratory: 1 hours/week

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: -
- laboratory: 14 hours
- home assignment: -
- preparation for the exam: 16 hours

Total: 30 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Chemical properties of waters, inorganic compounds, eutrophication ions. Organic substances in water, indicators of organic matter content. The conditions of water sampling, sample types. Interpretation of water treatment, classification of water treatment methods. Methods for degassing. Methods for removing soluble and floating substances.

Literature

- Snoeyink VL (2006) Water Chemistry. John Wiley & Sons Inc.
- Spellman FR (2014) The Science of Water: Concepts and Applications. CRC Press.
- Stanley EM (2010) Water Chemistry: Green Science and Technology of Nature's Most Renewable Resource.

Schedule:

1st week: Measurement of depth and transparency. Measurement of water conductivity in different water types.

2nd week: Instrumental measurement of pH, dissolved oxygen content and saturation in different water types.

3rd week: Surveying of water bed section by ultrasonic measuring instrument.

4th week: The pH. Acidity, alkalinity, water hardness.

5th week: Methods for determination of dissolved oxygen: classical analytical, electrochemical and optical methods.

6th week: Measurement of inorganic nutrients I. - Reduced nitrogen forms: ammonium.

7th week: Measurement of inorganic nutrients II. - Oxidized nitrogen forms: nitrite, nitrate.

8th week: Measurement of inorganic nutrients III. - Phosphorous forms.

9th week: Measurement of water nutrition indicators: chlorophyll content.

10th week: The most important metal ions in water: the classical analytical possibilities of iron and manganese detection.

11th week: Methods for measuring the organic matter content of waters I: measurement of chemical oxygen demand.

12th week: Methods for measuring the organic matter content of water II: compiling experiments to determine the biological oxygen demand.

13th week: Methods for measuring the organic matter content of water III: biological oxygen demand. Definition of BOI7.

14th week: Consultation.

Requirements:

Participation at classes is compulsory. A student must attend the laboratory practices and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there will be short written tests on every practice, reports should be prepared after every topic. The final grade will be the average of the grades of written tests and reports.

Person responsible for course: Dr. István Bácsi, associate professor, PhD

Lecturer: Dr. István Bácsi, associate professor, PhD

Title of course: Climate change and global environmental problems **Code**: TTEMG1010_EN	**ECTS Credit points:** 2

Type of teaching, contact hours

- lecture: -
- practice: 2 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 28 hours
- laboratory: -
- home assignment: 22 hours
- preparation for the exam: 10 hours

Total: 60 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

In this seminar students will learn the most significant environmental problems that act in a global scale. The related topics involve climate change, desertification, air pollution, greenhouse effect, pollution of the water and soil, the sustainable use of the environmental resources. The seminar provides an overview on the topics focusing on the possibilities for the preservation of the essential resources, sustainability in using environmental resources and the perspectives for the rehabilitation of the favourable state.

Literature

- Harris F. (2012) Global Environmental Issues, Second Edition. Wiley-Blackwell, pp. 358. ISBN: 978-11-199-5098-1
- Freedman B. (2014) Global Environmental Change. Springer, pp. 973 ISBN 978-94-007-5785-1

Schedule:

1st week Introduction to the course

2nd week Desertification

3rd week Air pollution, greenhouse effect

4th week Pollution of the water

5th week Pollution of the soil

6th week Sustainable use of the environmental resources

7th week Mid-term test

8th week Evaluating and discussing studies

9th week Evaluating and discussing studies

10th week Evaluating and discussing studies

11th week Evaluating and discussing studies

12th week Evaluating and discussing studies

13th week Evaluating and discussing studies

14th week End-term test

Requirements:

- for a signature

Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade

The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Dr. Horváth Roland, assistant professor, PhD, habil

Lecturer: : Dr. Horváth Roland, assistant professor, PhD, habil

Title of course: Applied ecology **Code**: TTEME2001_EN	**ECTS Credit points:** 1

Type of teaching, contact hours

- lecture: 1 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 14 hours
- practice: 0 hours
- laboratory: 0 hours
- home assignment: 8 hours
- preparation for the exam: 8 hours

Total: 30 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course is to delineate the possible application of general ecological principles and rules in environmental status assessment, moreover to adopt both the ecological and the economical approaches in social activity. In the course the students will get knowledge on the following topics: Definition of applied ecology and its relation to ecology. Ecology and environmental quality. Importance of different scales in time and space in the ecology. Ecological stability. Ecological effects of the anthropogenic environmental changes; ecological crisis. Monitoring methods of the ecological changes. Environmental stress. Ecological approach to harmonize the environmental status and the economic activity. Sustainable development and environmental sustainability. The ecosystem approach, status and change of ecological systems. Ecology, as a discipline for nature conservation and environmental protection.

Literature

- Beeby, A. 1993: Applying Ecology. Chapman & Hall, London.
- Huckle, J., Sterling S. R. 1996: Education for Sustainability. Earthscan Publications Ltd., London.
- Newman, E. I. 2000: Applied Ecology and Environmental Management. Blackwell Science Ltd., Oxford.

Schedule:

1st week Introduction to the course.

2nd week Applied ecology and its relation to ecology.

3rd week Applied urban ecology.

4th week Applied agroecology.

5th week Applied forestry ecology

6th week Applied nature conservation. Management of nature protected areas.

7th week Mid-term test.

8th week Applied landscape ecology. Fragmentation, isolation, linear landscape elements.

9th week GIS and remote sensing methods in applied ecology.

10th week Bioindication, biomonitoring, biodiversity monitoring.

11th week Ecotoxicology. Impacts of inorganic, organic compounds and stress factors.

12th week Bioremediation of contaminated waters and soils.

13th week Phytoremediation, phytoextraction, phytofiltration, phytovolatilisation, phytostabilisation, phytodegradation.

14th week End-term test

Requirements:
Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.
During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:
it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.
- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session

Person responsible for course: : Dr. Horváth Roland, assistant professor, PhD, habil

Lecturer: : Dr. Horváth Roland, assistant professor, PhD, habil

Title of course: Biodiversity **Code**: TTEME2005_EN / TTEMG2005_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Biodiversity is vital issue in biology and environmental sciences. Basic methods and ideas in diversity reasearch are introduced in details. Ecological theories releted to biodiversity are explained, icluding island biogeography, neutral models of ecology, and unified neutral theory of biodiversity. In environmental sciences new statistical tools are changing in which scientists analyze and interpret data and models. These new and rapidly developing methods and models are explained in details; their usage is demonstrated using R programming language and computing environment.

Literature

- Magurran, A.E. and McGill, B.J. 2010: Biological Diversity: Frontiers in Measurement and Assessment. OUP Oxford
- Magurran, A.E. 2004: Measuring Biological Diversity. Wiley.
- Ehrlich, P.R. and Ehrlich, A.H. 1983: Extinction: The Causes and Consequences of the Disappearance of Species. Ballantine Books.

Schedule:

1st week Introduction to the course

2nd week Biodiversity in ecology.

3rd week Basics of measuring ecology.

4th week Species-area relationships.

5th week Classical diversity statistics.

6th week One-parametric diversity statistics: Scale-dependent characterization.

7th week Exam

8th week Species intrapolation..

9th week Species extrapolation.

10th week Classical paradigm of measuring diversity.

11th week. Pattern dependent and density dependent representations..

12th week. Direct and indirect diversity representations.

13th week. Diversity in ecosystem servics.

14th week Exam

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two tests is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Prof. Dr. Béla Tóthmérész, university professor, DSc

Lecturer: Prof. Dr. Béla Tóthmérész, university professor, DSc

Title of course: Basics of terrestrial and soil ecology **Code**: TTEME2010_EN / TTEMG2010_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: exam, mid-semestergrade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course to introduce the basic ecological processes and their effect on the environment and nature. Besides providing the state-of-art theoretical background, case studies will also be provided to each topic in order to reveal practical aspects. The course provide knowledge on the aspects of vegetation succession; global and local effects of land use changes, habitat loss and fragmentation; ecological processes in urban habitats; ecosystem services and estimation of the ecological footprint; application of remotely sensed data in environmental and conservational projects.

Literature

- Pásztor L., Botta-Dukát Z., Magyar G., Czárán T., Meszéna G. (2016) Theory-Based Ecology A Darwinian approach. Oxford University Press, pp. 301. ISBN: 978-01-995-7785-9
- Robert J. Whittaker, José María Fernández-Palacios (2007): Island Biogeography Ecology, evolution, and conservation Oxford University Press, USA ISBN 978-01-985-6612-0

Schedule:

1st week Introduction to the course

2nd week Intorduction to pedobiology

3rd week Pollutants

4th week Metals

5th week Indication

6th week Remediation

7th week: Mid-term test

8th week Soil cleaning

9th week Conservation and management of grassland ecosystems

10th week Urbanisation, urban ecology

11th week Role of ecosystem engineering species in natural habitats

12th week Sustainable land use

13th week Ecology and agriculture

14th week End-term test

Requirements:

- for a signature

Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade

The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Dr. Kundrát-Simon Edina, associate professor, PhD, habil.

Lecturer: Dr. Kundrát-Simon Edina, associate professor, PhD, habil.

Title of course: Soil protection and soil biota **Code**: TTEME2015_EN / TTEMG2015_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: 1 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 14 hours
- practice: 14 hours
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Introduction to soil ecology. Key concepts of seedbank ecology. Occurrence of heavy metals in soils. Effects of heavy metal pollutions on soil biotas. The relationship between soil structure and edafon. Major groups of soil mesofauna. Major groups of soil macro- and megafauna.

Literature

- Thompson, K., Bakker, J.P, Bekker, R.M. (1997) Soil seed bank of North West Europe: Methodology, density and longevity. Cambridge University Press, Cambridge. ISBN: 9780521495196
- Killham, K. (1994) Soil Ecology. Cambridge University Press, Cambridge. ISBN: 9780412338106
- Brown, A.L. (1978) Ecology of Soil Organisms. Heinemann Educational Books, London. ISBN: 9780435606206

Schedule:

1st week Soil pollution. Reasons and mechanisms.

2nd week Heavy metals in soils and their effects on soil organisms. Determination of soil metal concentration.

3rd week The use of soil organisms as bioindicators.

4th week The study of heavy metal concentrations in soils and soil organisms. Bioaccumulation.

5th week The biological components of soils. Soil biodiversity and soil organisms. Classification of soil fauna.

6th week The role of soil biodiversity. The components of soil organic matter. protozoans, tardigrades, mites and springtails.

7th week: The significance and most important members of protozoans and nematodes.

8th week The most important members of ground-dwelling spiders, terrestrial isopods, ground beetles and ants.

9th week The most important members of terrestrial snails, earthworms, muskrats.

10th week The definition of soil. The physical, chemical and biological processes of soil formation. The most important parameters of soil assessment.

11th week Soil types and soil classification.

12th week The basics of seed bank ecology. The definition and types of seed bank.

13th week The significance and types of seed bank studies. Germination seed bank studies. A case study.

14th week The effects of urbanization on ground-dwelling arthropods. A case study.

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-*an offered grade*:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Dr. Roland Horváth, assistant professor, PhD

Lecturer: Dr. Roland Horváth, assiatnt professor, PhD;
Dr. Péter Török, associate professor, DSc,
Dr. Edina Simon, associate professor, PhD

Title of course: Hydrobiology and wetland ecology **Code**: TTEME2020_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: - hours
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Students will be provided with state-of-the-art basic knowledge of wetland flora and fauna and ecology. The course emphasizes wetlands functions and values in an ecosystem perspective. Both saltwater and freshwater wetlands will be addressed in the course. The relationship of wetlands to adjacent terrestrial and deep water habitats, along with wetlands succession and dynamics will be discussed.

This course provides instruction in the following topics: wetland hydrology; wetland vegetation; major faunal populations associated with wetlands; wetland plant and animal communities, ecosystem relationships, and dynamic processes; wetland classification systems, principles of wetlands ecology and dynamics; evaluation of wetland functions; overview of wetland development, restoration, and constructed wetlands.

Literature

Compulsory:

1. Mitsch,W.J. ,J.G.Gosselink, C.J.Anderson and L.Zhang. (2009): Wetland Ecosystems, John Wiley & Son, Inc., NewYork.
2. Wright, W. and J. Gosselink (2007):Wetlands, John Wiley & Sons, Inc.
3. Keddy P.A. (2010): Wetland Ecology Principles and Conservation, Cambridge University Press

Schedule:

1st week

Definition of wetland. Wetland functions: hydrologic processes, water quality improvement, wildlife habitat. Productivity of wetlands.

2nd week

Classification of wetland systems. Freshwater and coastal wetlands.

3rd week

Formation, chemistry, and biology of wetland soils. Soil forming factors. Features of hydric soils, horizonization. Types of wetland soils.

4th week

Organic vs inorganic soils. Redox reactions, carbon , phosphorous, sulfur and nitrogen transformations in the wetland soils.

5th week

Soil communities in wetlands, their importance in the formation and change of the soils. Biological indicator species and assemblages.

6th week

Vegetation and fauna of wetlands. The most important species and taxa.

7th week

Adaptations of plants to wetland environments: structural adaptations (aerenchyma, adventitious roots, stem elongation, lenticels, pneumatophores), physiological adaptations (anaerobic respiration, malate production, carnivorous nutrition).

8th week

Adaptatation of animals to wetland environment. Adaptation to salt stress (osmoregulation) and anoxia. Necton adaptations. Estuarine-dependent life cycles. Importance of wetlands in the bird migration.

9th week

Wetlands as ecosystems. Trophic structures. Features of bio-geochemical cycles. Carbon cycle.

10th week

Nitrogen cycle (fixation, ammonification, immobilizátion, nitrification and denitrification). Phosphorus and sulphur cycles.

11th week

Primer and secunder production in wetlands. Proctivity of different types of wetlands.

12th week

The Ramsar Convention on Wetlands. Key features of the Ramsar Convention.

13th week

Wetland and landscape. Restoration of wetlands. Constructed wetlands

14th week

Consultation or exam

Requirements:

- for a signature

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of further absences, a medical certificate needs to be presented.

- for a grade

The course ends in a written **examination**. 2 (Pass) Grade: 50% of the maximum points available. If the score of any test is below 50%, students can take a retake test.

-an offered grade:

There are at least two test during the semester, and the offered grade is the average of them.

Person responsible for course: Dr. István Grigorszky associate professor, PhD

Lecturer: Dr. István Grigorszky associate professor, PhD

Title of course: Hydrobiology and wetland ecology **Code**: TTEMG2020_EN	**ECTS Credit points: 1**

Type of teaching, contact hours

- lecture: -
- practice: 1 hours/week
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 14 hours
- laboratory: -
- home assignment: 8 hours
- preparation for the exam: 8

Total: 30 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

Students will be provided with state-of-the-art basic knowledge of wetland flora and fauna and ecology. The course emphasizes wetlands functions and values in an ecosystem perspective. Both saltwater and freshwater wetlands will be addressed in the course. The relationship of wetlands to adjacent terrestrial and deep water habitats, along with wetlands succession and dynamics will be discussed.
This course provides instruction in the following topics: wetland hydrology; wetland vegetation; major faunal populations associated with wetlands; wetland plant and animal communities, ecosystem relationships, and dynamic processes; wetland classification systems, principles of wetlands ecology and dynamics; evaluation of wetland functions; overview of wetland development, restoration, and constructed wetlands.

Literature

Compulsory:

4. Mitsch,W.J. ,J.G.Gosselink, C.J.Anderson and L.Zhang. (2009): Wetland Ecosystems, John Wiley & Son, Inc., NewYork.
5. Wright, W. and J. Gosselink (2007):Wetlands, John Wiley & Sons, Inc.
6. Keddy P.A. (2010): Wetland Ecology Principles and Conservation, Cambridge University Press

Schedule:

1st week

Importance of hydrologic processes (recharging and discharging wetlands). Importance of water quality improvement.

2nd week

Discussing wetland types of student's country.

3rd week

Methods for analysis of soil structure and physical characteristics. The importance of soil gas content.

4th week

Methods for analysis of soil chemical characteristics.

5th week

Methods for investigating of soil fauna and flora.

6th week

.Showing the most important plant and animal taxa according to the wetland types.

7th week

Presentation of structural and physiological adaptations of plants.

8th week

Definition of osmosis. Mechanisms of osmoregulation. Conformers and regulators.

9th week

Trophic structures of different wetland types. General features of bio-geochemical cycles. Energy flow int he ecosystems.

10th week

Adaptation of plants and animal to low nitrogen content.

11th week

Primer and secunder production in wetlands. Proctivity of different types of wetlands.

12th week

The Ramsar Convention on Wetlands. Key features of the Ramsar Convention.

13th week

Wetland and landscape. Restoration of wetlands. Constructed wetlands

14th week

Consultation

Requirements:

- for a signature

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of further absences, a medical certificate needs to be presented.

- for a grade

The course ends in an written **examination**. 2 (Pass) Grade: 50% of the maximum points available. If the score of any test is below 50%, students can take a retake test.

-an offered grade:

There are at least two test during the semester, and the offered grade is the average of them.

Person responsible for course: Dr. István Grigorszky associate professor, PhD

Lecturer: Dr. István Grigorszky associate professor, PhD

Title of course: Field sampling in environmental science **Code**: TTEMG3001_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: -
- practice: 2 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 28 hours
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The course provide the students the most important knowledge in research planning, experimental research and introduce the most important field methods of data collection. The course focus on methods frequently used in environmental assessment and evaluation focusing on essential sampling methods of vegetation coverage and height, biomass, soil seed bank or sampling of water plants and algae. The course provide knowledge on data collection and basic analysis and representation tools in data analyses and recording. The course introduce the theory of trait-based ecosystem analyses, provide information of trait measurements and analyses, and provide essential guideline for trait-based ecosystem engineering and ecological strategies based analyses in environmental sciences.

Literature

- Moore PD and Chapman SB (1986): Methods in plant ecology. Blackwell Scientific Publications, Oxford.
- Martin Kent, Paddy Cooker (1995): Vegetation description and analysis – A practical approach. Wiley, Chichester.
- Gordon A. Fox, Simonetta Negrete-Yankelevich, Vinicio J. Sosa (eds.) (2015): Ecological Statistics – Contemporary theory and application. Oxford University Press, Osxford.

Schedule:

1st week Introduction to the course

2nd week Principles of field sampling

3rd week Design of field experiments

4th week Field sampling in terrestrial plant communities I

5th week Field sampling in terrestrial plant communities II

6th week Field sampling in terrestrial plant communities III

7th week: Mid-term test

8th week Sampling of freshwater assemblages I

9th week Sampling of freshwater assemblages II

10th week Sampling of freshwater assemblages III

11th week Sampling in animal communities I

12th week Sampling in animal communities II

13th week Sampling in animal communities III

14th week End-term test

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session

Person responsible for course: Dr. Péter Török, university professor, DSc.

Lecturer: Dr. Péter Török, university professor, DSc
Prof. Dr. Tóthmérész Béla, university professor, DSc
Dr. Kundrát-Simon Edina, associate professor, PhD
Dr. Roland Horváth, assistant professor, Ph.D.

Title of course: Field ecology and environmental conservation practice **Code**: TTEMG3005_EN	**ECTS Credit points:** 4

Type of teaching, contact hours

- lecture: -
- practice: 40 hours/semester
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 40 hours
- laboratory: -
- home assignment: 40 hours
- preparation for the exam: 40 hours

Total: 120 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the field course is to introduce the application of the practical and theoretical knowledge acquired during courses and seminars in institutes, moreover to get to know the actions, innovates and problems of the institutes, works and factories on the field of environmental and nature protection. Stu-dents will visit nature protected sites, they will get knowledge about the main field sampling methods, the main habitat restoration measures and the widely applied habitat management techniques. The students will be introduced to the technology of drinking water production from surface waters, the treatment methods of communal and industrial sewages, the problems and solutions regarding waste management, and the land rehabilitation and recultivation methods. During the field course the main monitoring systems on air-, soil, water, and noise pollution are also introduced.

Literature

- Newman, E. I. 2000: Applied Ecology and Environmental Management. Blackwell Science Ltd., Ox-ford.
- Henderson, P. A., Southwood, T. R. E. 2016: Ecological Methods. 2016: John Wiley & Sons Ltd., Chichester.

Schedule:

5-day long field practice.

Requirements:

During the semester there are one test after the field practice.

The minimum requirement for the test is 60%. Based on the score of the tests, the grade for the test is given according to the following table:

Score	Grade
0-59	fail (1)

60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)
Person responsible for course: Dr. Horváth Roland, assistant professor, habil.	
Lecturer: Dr. Horváth Roland, assistant professor, habil.	

Title of course: Environmental problems and rehabilitation **Code**: TTEME3010_EN / TTEMG3010_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The course introduces the environmental crisis and most important tipping points of landscape-scale degradation of ecosystem functions and services. The course introduces the most important strategies, methods and measures of terrestrial and aquatic ecosystem rehabilitation and restoration. The primary objective of this course is to allow the students to become familiar with the scope of environmental rehabilitation and restoration and to master its basic facts, principles, concept and fundamental processes. The concepts of green infrastructure, natural capital, ecosystem services and functions, and trait-based ecosystem engineering will be presented and by using 'real-world' examples from terrestrial and aquatic habitat restoration measures the students will be provided by essential knowledge on ecosystem functioning of the subjected habitats and tools of ecosystem restoration and recovery.

Literature

- Jelte Van Andel and James Aronson (eds.) (2012): Restoration Ecology: The New Frontier. Wiley-Blackwell Publishing, Chichester.
- Margaret A. Palmer, Joy B. Zedler, Donald A. Falk (eds.) (2016): Foundations of Restoration ecology. Island Press, Washington D.C.
- David Blakesly, Peter Buckley (2016): Grassland restoration and management. Pelagic Publishing, Exeter UK.

Schedule:

1st week Introduction to the course

2nd week Global environmental problems

3rd week Threats and drivers of biodiversity

4th week Principles of environmental and habitat restoration I

5th week Principles of environmental and habitat restoration II

6th week Rehabilitation and restoration of terrestrial communities I

7th week Rehabilitation and restoration of terrestrial communities II

8th week: Rehabilitation and restoration of terrestrial communities III

9th week Rehabilitation and restoration of terrestrial communities IV

10th week Rehabilitation and restoration of terrestrial communities V

11th week Rehabilitation and restoration of freshwater and marine communities I

12th week Rehabilitation and restoration of freshwater and marine communities II

13th week Application and cost effectiveness of recovery methods

14th week End-term test

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session

Person responsible for course: Dr. Péter Török, university professor, DSc
Lecturer: Dr. Péter Török, university professor, DSc

Title of course: Environmental technology and ecotoxicology **Code**: TTEME3015_EN / TTEML3015_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 1 hours/week
- practice: 2 hours/week
- laboratory: 0 hours/week

Evaluation: exam, practical grade

Workload (estimated), divided into contact hours:

- lecture: 14 hours
- practice: 28 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course to introduce the toxicology and the different biochemical, ecological and molecular methods in toxicology. The course give knowledge about acute and chronic toxicity; exposure classes, toxicants in air, water and soil; metabolism, absorption, distribution and elimination of toxicants; teratogenesis; carcinogenesis; environmental toxicology, transport and fate of toxicants in the environment; environmental risk assessment and analytical methods in toxicology.

Literature

- Hodgson E (2004) A textbook of modern toxicology. John Wiley and Sons.
Online ISBN: 9780471646778
- Nikinmaa M (2014) An introduction to Aquatic Toxicology. Elsevier. eBook ISBN: 9780124115811

Schedule:

1st week Introduction to the course

2nd week History of toxicology

3rd week Definition of poison, poisoning, classification of poison and toxicants

4th week Animal, plant and mycotoxins

5th week Interaction of toxicants, chemical structure of toxicants

6th week Absorption, distribution and elimination of toxicants

7th week: Effects of toxicants on nervous system, digestive system and sensory organs.

8th week Effects to toxic heavy metals

9th week Definition of teratogenesis; carcinogenesis and environmental toxicology

10th week Classification of test for toxicology

11th week Toxicology tests for soil

12th week Toxicology tests for water

13th week Micro and mezcosmos test for toxicants

14th week End-term test

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session

Person responsible for course: Dr. Edina-Kundrát-Simon, associate professor, PhD

Lecturer: Dr. Edina-Kundrát-Simon, associate professor, PhD

Title of course: Terrestrial ecosystems and landscape protection **Code**: TTEME4001_EN / TTEMG4001_EN	**ECTS Credit points: 4**

Type of teaching, contact hours

- lecture:2 hours/week
- practice:1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice:14 hours
- laboratory: -
- home assignment: 36 hours
- preparation for the exam: 42 hours

Total: 120 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s):-

Further courses built on it:-

Topics of course

The course aims to enhance the knowledge of Central-European terrestrial ecosystems. The most important grassland and forest ecosystems of Central-Europe will be discussed, with a special focus on the relationships between abiotic environmental characteristics (soil type, moisture regime, elevation, topography, climate) and the vegetation composition of the habitats. We will discuss the importance of habitat indication, ecological limitation and habitat affinity in habitat quality assessment. Students will learn about the most important ecosystems, they will be able to identify their typical plant species using identification guides. They will be able to evaluate the naturalness and degradation status of an ecosystem.

Literature

- Borhidi A., Kevey B., Lendvai G. 2012: Plant communities of Hungary. Akadémiai Kiadó, Budapest (2012), p. 544.
- Leuschner C., Ellenberg H. (2017): Vegetation Ecology of Central Europe I-II. Springer, Switzerland.
- Tutin, T. G. (Ed.). (1980). Flora europaea (Vol. 5). Cambridge University Press.

Schedule:

1st week Introduction to the course

2nd week Factors influencing vegetation patterns on the earth

3rd week Introduction to the biomes

4th week Vegetation zonation, indication, limiting factors

5th week Community degradation, regeneration and succession

6th week Adaptation strategies of the plants to different environmental conditions

7th week: Mid-term test

8th week Major types of grasslands 1: semi-natural grasslands and steppes

9th week Major types of grasslands 2: azonal and extrazonal grasslands

10th week Major types of wetlands: lakeshore and riverbank vegetation, fens, bogs and marhes

11th week Shrublands and heathlands

12th week Zonal forest communities

13th week Extrazonal forests and tree plantations

14th week End-term test

Requirements:

- for a signature

Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade

The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Prof. Dr. Tóthmérész Béla, university professor, DSc

Lecturer: Prof. Dr. Tóthmérész Béla, university professor, DSc

Title of course: Air pollution and environmental conservation **Code**: TTEME4005_EN / TTEMG4005_EN	**ECTS Credit points:** 3

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The students are introduced to the institutional background of the European nature and environmental conservation and conservational projects which linked nature conservation and environmental protection. The course provides and an overview on the principles in designating of conservational areas, relations of species protection and environmental filters, trait based environmental and conservation filters and the role of civil participation in environmental actions.

Literature

- Huckle, J., Sterling S. R. 1996: Education for Sustainability. Earthscan Publications Ltd., London.
- Newman, E. I. 2000: Applied Ecology and Environmental Management. Blackwell Science Ltd., Oxford.

Schedule:

1st week Introduction to the course

2nd week Introduction to Air pollution

3rd week Definition and process of Air pollution

4th week Primary and Secondary Pollutants

5th week Smogs

6th week Global air pollution problems

7th week Exam

8th week Introduction of case studies (wetlands)

9th week Introduction of case studies (dry habitats)

10th week Environmental technologies and leaves, as environmental pollution indicators

11th week Environmental statistics

12th week Climate change

13th week Civil participation in conservation

14th week Exam

Requirements:

- for a signature
Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade
The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Dr. Kundrát-Simon Edina, associate professor, PhD, habil.

Lecturer: Dr. Kundrát-Simon Edina, associate professor, PhD, habil.

Title of course: Aquatic environmental and nature conservation lecture and seminar **Code**: TTEME4010_EN / TTEMG4010_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 28 hours/week
- seminar: 14 hours/week
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- seminar: 14 hours
- laboratory: -
- home assignment: 14 hours
- preparation for the exam: 34 hours

Total: 90 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

What we call Environmental sciences. Natural values of the Earth, conservation of biodiversity. Effects of invasive species. Protection of habitats, prevention of species extinction. Short term and long term monitoring systems. Biomonitoring and MAB (Man and Biosphere programe). Aquatic biomonitoring, Aquatic Ecology

Literature

Compulsory:

H. Frances (2005): Global Environmental Issues. John Wiley & Sons, USA
ISBN: 978-0-470-09395-5
M. K. Wali, F. Evrendilek, M. S. Fennessy (2009): The Environment: Science, Issues, and Solutions. CRC Press ISBN: 9780849373879
J.M. Fryxell, A. R. E. Sinclair, G. Caughley (2014): Wildlife Ecology, Conservation, and Management. Wiley-Blackwell ISBN: 978-1-118-29106-1

Schedule:

1st week

Main parts of Environmental Siences, objects of Environmental Sciences

2nd week

Levels of living world.

3rd week

Basis of monitoring and biomonitoring systems

4th week

Levels of Ecology, ecological methods in environmental sciences

5th week

Biodiversity

6th week

Indication
7th week
Ecological footprint
8th week
Man and Biosphere program
9th week
Basis of water protections
10th week
Water protection systems
11th week
Water protection conventions
12th week
European Water Framework Directive
13th week
Zooplankton in nature conservation
14th week
Consultation or exam.

Requirements:

- for a signature
Attendance at lectures is recommended, but not compulsory.

- for a grade
The course ends in a written examination. 2 (Pass) grade: 50% of the maximum points available. If the score of any test is below 50%, students can take a retake test.

-an offered grade:
There are at least two tests during the semester, and the offered grade is the average of them.

Person responsible for course: Dr. István Gyulai, assistant professor, PhD

Lecturer: Dr. István Gyulai, assistant professor, PhD

Title of course: Environmental policy and communication **Code**: TTEME5001_EN / TTEMG5001_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 1 hours/week
- practice: 2 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 14 hours
- practice: 28 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The course aims at to provide essential information on current environmental problems and helps the students to develop their own research profile in environmental science by supporting their skills in scientific writing and communication. The course introduces the indicators of scientometrics (impact factor, citation metrics, journal ranking) and provide guidelines for journal selection for their results in environmental sciences. The students will be provided with the necessary tools of scientific writing, scientific presentations (scientific poster and oral presentation), paper writing and basic tools in the analysis of environmental problems and issues of research.

Literature

- David H. Foster (2017): A concise guide to communication in science and engineering. Oxford University Press, Oxford.
- Ken Peach (2017): Managing Science – Developing your Research Leadership and Management Skills. Oxford University Press, Oxford.
- Heard S.B. (2016): The Scientist's Guide to Writing: How to Write More Easily and Effectively throughout Your Scientific Career. Princeton University Press, Princeton.

Schedule:

1st week Introduction to the course

2nd week Principles of environmental policy and communication

3rd week An introduction to scientometrics

4th week Ways of scientific communication

5th week Informal communication – Scientific conference presentations

6th week Formal communication – Scientific papers, books and book chapters

7th week: Paper writing I

8th week Paper writing II

9th week Paper writing III.

10th week Submission and editorial communication

11th week Editorial work and review

12th week Scientific group management and proposal writing I

13th week Scientific group management and proposal writing II

14th week End-term test

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Dr. Péter Török, university professor, DSc

Lecturer: Dr. Péter Török, university professor, DSc

Title of course: Environmental communication and use of scientific databases **Code**: TTEMG5005_EN	**ECTS Credit points:** 3

Type of teaching, contact hours

- lecture: -
- practice: 2 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 28 hours
- laboratory: -
- home assignment: 52 hours
- preparation for the exam: 10 hours

Total: 90 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The student gets an overview on the most up to data online databases and sources that can be used for gathering data for scientific researches, project proposals or assessments. These data involves databases of scientific publications, freely available databases of the European Union, data regarding climatic parameters and remotely sensed data. The students will be introduced to the basic data search and management methods, which will support them both in their scientific and practical career.

Literature

- Cornell University Library: Tutorial: Searching using Web of Science. (http://guides.library.cornell.edu/webofscience)
- M Library: Research Impact Metrics: Citation Analysis. (http://guides.lib.umich.edu/citation/Scopus)
- European Union: Eurostat. (http://ec.europa.eu/eurostat/)
- World Ozone and Ultraviolet Radiation Data Centre (http://www.woudc.org/)
- NASA Ozone Watch (https://ozonewatch.gsfc.nasa.gov/)
- Tropospheric Emission Monitoring Internet Service (http://www.temis.nl/index.php)

Schedule:

1st week Introduction to the course

2nd week Using electronic databases for searching publications

3rd week Research Impact Metrics

4th week Database of the European Union, Eurostat

5th week Database on air quality and radiation

6th week Emission monitoring

7th week Mid-term test

8th week Evaluating and discussing studies

9th week Evaluating and discussing studies

10th week Evaluating and discussing studies

11th week Evaluating and discussing studies

12th week Evaluating and discussing studies

13th week Evaluating and discussing studies

14th week End-term test

Requirements:

- for a signature

Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade

The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Dr. Deák Balázs, assistant professor, PhD

Lecturer: Dr. Deák Balázs, assistant professor, PhD;
Prof. Dr. Magura Tibor, university professor, DSc

Title of course: Environmental modelling **Code**: TTEME6001_EN / TTEMG6001_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 1 st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course is to introduce the idea, methods and basic tools of environmental modelling, environmental statistics, and the basics of statistical simulation of environmental problems.

Literature

- Venables, W. N. and Ripley, B. D. 2003: Modern Applied Statistics with S. 4th edition. Springer, New York.
- Wainwright, J. and Mulligan, M. 2013: Environmental Modelling: Finding Simplicity in Complexity. John Wiley & Sons.
- Otto, S.P. and Day, T. 2007: A Biologist's Guide to Mathematical Modeling in Ecology and Evolution. Princeton University Press.

Schedule:

1st week Introduction to the course

2nd week Basics of model building in science.

3rd week Introduction to the programming languages, with special reference to R programming language end programming environment.

4th week Elementary model building; simple growth models.

5th week Limits of growth; Malthus models. Other models of limted growth .

6th week Discrete and continuous models; chaotic dynamics .

7th week Exam

8th week Elementary environmental statistics.

9th week Spatial models in environmental statistics .

10th week . Analysis of variance (ANOVA) to analyse environmental data.

11th week . General linear models and generalized linear models.

12th week.Multivariate methods in environmental statistics: classification.

13th week. Multivariate methods in environmental statistics: ordination.

14th week Exam

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two tests is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Prof. Dr. Béla Tóthmérész, university professor, DSc

Lecturer: Prof. Dr. Béla Tóthmérész, university professor, DSc

Title of course: Biostatistics **Code**: TTEME6005_EN / TTEMG6005_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: practical grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 1 st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

A comprehensive introduction to probability, probability distributions, sampling distributions, basic techniques of statistical inference, analysis of variance, linear regression, inference for categorical variables, and nonparametric statistics. This course is designed to teach the students about a variety of mathematical methods which are used in modelling through their application to solving hydrobiological problems. In the practical part of the course students learn the methods of mathematical methods of data processing and planning of experiment.

Literature

- Venables, W. N. and Ripley, B. D. 2003: Modern Applied Statistics with S. 4th edition. Springer, New York.
- Cox D.R., Donnelly C.A. (2011): Principles of Applied Statistics Cambridge University Press
- Wasserman L. (2004): All of Statistics: A Concise Course in Statistical Inference, Springer;

Schedule:

1st week Introduction to the course

2nd week Basics of model building in science.

3rd week Introduction to the programming languages, with special reference to R programming language end environment.

4th week Basics of data management.

5th week Graphical methods in descriptive statistics.

6th week Basic statistics; statistical distributions

7th week Exam

8th week Sampling, design of experiments.

9th week Regression analyses.

10th week Analysis of variance (ANOVA).

11th week General linear models and generalized linear models.

12th week Multivariate methods: classification.

13th week Multivariate methods: ordination.

14th week Exam

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two exams is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Prof. Dr. Béla Tóthmérész, university professor, DSc

Lecturer: Prof. Dr. Béla Tóthmérész, university professor, DSc

Title of course: Biogeography **Code**: TTEME6010_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: -
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course to introduce the ecological and geographical background of the biogeography as an interdisciplinary science. The course provide knowledge on the relationship between wildlife and its geographical environment, tolerance, adaptation, spread of species, distribution patterns of wildlife, vikarism, pseudovikarism, zonality, biodiversity, flora and fauna empires and biogeographical empires. Besides this the aim of the course the characterization of the environmental conditions and the zonal, intrazonal wildlife of the individual biomes: tropical rainforest, savannah, tropical monsoon, tropical deserts, Mediterranean hardwood forest, subtropical monsoon forest, deciduous forest, steppe, moderate desert and semi-desert, tajga and tundra. Finally, the course introduces the vertical zonality of tropical and moderate zone mountains.

Literature

Mark Lomolino, Brett Riddle, Rober J. Whittaker (2017): Biogeography. Sinauer.
ISBN 978-1-6053-5472-9

Andrew Millington, Mark Blumler, Udo Schickhoff (eds.) (2011): The SAGE Handbook of Biogeography. SAGE Publications Ltd. London. ISBN: 978-1-4129-1951-7

Schedule:

1st week Introduction to the course

2nd week Place of biogeography in the system of the sciences

3rd week Ecological and biogeographical basics

4th week Relationship between wildlife and its geographical environment, tolerance, adaptation

5th week Spread of species, distribution patterns of wildlife

6th week Vikarism, pseudovikarism

7th week Vertical and horizontal distribution of the wildlife on Earth, zonality, intra- and extrazonality, biodiversity

8th week Flora and fauna empires, biogeographical empires

9th week Characterization of the environmental conditions and the zonal wildlife of the tropical rainforest and savanah

10th week Characterization of the environmental conditions and the zonal wildlife of the tropical monsoon forest and tropical deserts

11th week Characterization of the environmental conditions and the zonal wildlife of the Mediterranean hardwood forest, subtropical monsoon forest and deciduous forest

12th week Characterization of the environmental conditions and the zonal wildlife of the steppe, moderate semi-desert and desert

13th week Characterization of the environmental conditions and the zonal wildlife of the tajga and tundra

14th week The vertical zonality of tropical and moderate zone mountains.

Requirements:

Participation at classes is not compulsory, but highly recommended. The minimum requirement for the examination respectively is 60%. The grade for the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Person responsible for course: Dr. Négyesi Gábor, associate professor, PhD

Lecturer: Dr. Négyesi Gábor, associate professor, PhD

Title of course: Behaviour and evolution in urban environments **Code**: TTEMG6015_EN	**ECTS Credit points:** 4

Type of teaching, contact hours

- lecture: -
- practice: 4 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 56 hours
- laboratory: -
- home assignment: 34 hours
- preparation for the exam: 30 hours

Total: 120 hours

Year, semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses built on it:-

Topics of course

The objective of the course is twofold, first to enable students to integrate previously acquired knowledge from the fields of zoology, animal behaviour, evolution and ecology, second, to use that knowledge to critically evaluate the latest studies of organismal response to urbanization and human induced rapid environmental change. The students will primarily learn about novel adaptations (behavioural, physiological, and morphological), which have recently appeared in response to colonization of built, urban environments in diverse taxonomic groups of animals. More than half of the global human population now resides in cities, therefore it is important that students become familiar with the effects of rapidly expanding urban environments on native organisms.

Literature

- Diego Gil and Henrik Brumm (eds.): Avian Urban Ecology: Behavioral and Physiological Adaptations. (Oxford University Press, 2014)
- Ulrika Candolin and Bob B. M. Wong (eds.) Behavioral Responses to a Changing World: Mechanisms and Consequences (Oxford University Press, 2012)

Schedule:

1st week Introduction: Cities as evolutionarily novel environments. Urban ecosystems.

2nd week Behavioural and ecological predictors of the propensity to colonize urban environments.

3rd week Urban heat islands. Effects of light pollution.

4th week Cities as never depleting food sources.

5th week Urban phenology: timing of reproduction in cities.

6th week Communication in urban noise.

7th week Urban predators.

8th week Cities as sources of novel parasites and pathogens.

9th week Effects of toxins and heavy metal pollution in urban areas.

10th week Roles of phenotypic plasticity and genetic adaptation in urbanization.

11th week Speciation in urban areas.

12th week Invasive species in urban areas.

13th week Research methods of adaptations to urban environments.

14th week Student presentations.

Requirements:

Participation at the classes is compulsory. A student may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

Students will be evaluated based on two deliverables: (1) a brief, 15 min oral presentation given on the last class (14th week) on the topic of an adaptation to the urban environment, (2) a mini-review type paper submitted on the topic of the oral presentation.

The minimum requirement for both the presentation and the paper is 60%. The final grade will be composed (averaged) from the grades given to the presentation and the paper. Grades are given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Person responsible for course: Dr. Zoltán Németh, assistant professor, PhD

Lecturer: Dr. Zoltán Németh, assistant professor, PhD

Title of course: Community ecology and soil protection **Code**: TTEME7001_EN / TTEMG7001_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: 1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The aim of the course to provide an introduction to the study of pattern and process in plant and animal communities with an emphasis on theoretical and experimental approaches. The related topics include ecological processes that create, maintain or modify patterns of biodiversity; biodiversity and ecosystem function; island biogeography; meta-community dynamics; niche and neutral theory; species interactions (intra- and interspecific competition, predation, food webs) and species coexistence; and effects of human-mediated environmental change (climate change, land use change, habitat alteration, invasive species) on biodiversity.

Literature

- Kendall R.J., Lacher T.E., Cobb G.P., Cox S.B. (2010) Wildlife toxicology. Taylor and Francis Group, pp. 340. ISBN 978-1-439-81794-0
- Begon M., Townsen, C.R., Harpe, J.L. (2006) Ecology: from individuals to ecosystems. Blackwall Publishing, Oxford, pp. 750. ISBN: 978-1-405-11117-1
- Dempster J. (1975) Animal population ecology. Academic Press, London, pp. 155. ISBN: 0-12-209550-2-X
- Schulze E-D., Beck E., Müller-Hohenstein K., Lawlor D., Lawlor K., Lawlor G. (2005) Plant Ecology, SpringerVerlag, Berlin, Heidelberg, pp. 702. ISBN 978-3-540-20833-4

Schedule:

1st week Ecological processes that create, maintain or modify patterns of biodiversity.

2nd week Biodiversity and ecosystem function.

3rd week Island biogeography.

4th week Meta-community dynamics.

5th week Niche and neutral theory.

6th week Species interactions: intraspecific competition.

7th week: Species interactions: interspecific competition.

8th week Species interactions: predation.

9th week Species interactions: food webs.

10th week Species coexistence.

11th week The effects of climate change on biodiversity.

12th week The effects of land use change on biodiversity.

13th week The effects of habitat alteration on biodiversity.

14th week The effects of invasive species on biodiversity.

Requirements:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week.

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

-an offered grade:

it may be offered for students if the average grade of the two designing tasks is at least satisfactory (3) and the average of the mid-term and end-term tests is at least satisfactory (3). The offered grade is the average of them.

- in case an offered grade cannot be given, or it is not convenient for the student there is a possibility to have an exam in the exam session.

Person responsible for course: Dr. Roland Horváth, assistant professor, PhD

Lecturer: Dr. Roland Horváth, assistant professor, PhD
Dr. Péter Török, university professor, DSc,
Dr. Edina Simon, associate professor, PhD

Title of course: River ecology **Code**: TTEME7005_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: 0 hours
- laboratory: 0 hours
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 2nd year, 1 st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

This course will support the understanding of major physical and biological features of streams and rivers; the drivers of biodiversity of running waters. We introduce the fundamental processes responsible for the patterns of riverine structure, and function and critical issues associated with the conservation and management of streams and their biota. We demonstrate the functional aspects of running waters and their ecological state by comparing natural and human impacted running water types.

Literature

Allan J.D. Castillo M.M., (2011) Stream Ecology: Structure and function of running waters, Springer Netherlands,
Michael J. and Mills D., (1990): Freshwater Ecology: Principles and Applications, Wiley-Blackwell,
Giller P.S. (1999): The Biology of Streams and Rivers (Biology of Habitats), Oxford University Press, USA,
APHA (2012): Standard Methods for the Examination of Water and Wastewater, Clearway Logistics Phase 1a;

Schedule:

Lectures:

1st week Water resources and water cycle.

2nd week The streamflow system.

3rd week Zonation of watercourses.

4th week Water temperature and dissolved oxygen.

5th week The sedimentation process.

6th week Organic matter processing.

7th week River continuum concept, guilds.

8th week Ecological zonation of streams.

9th week Floodplain landforms.

10th week Typology of springs and running waters.

11th week Succession patterns of fish populations.

12th week Main streams of the Carpathian Basin: River Danube.

13th week Main streams of the Carpathian Basin: River Tisza.

14th week Grade-offering exam.

Requirements:
Lecture:

The minimum requirement for the examination is 50% from the midterm and closing tests. Based on the summarized score of the test the grade for the examination is given according to the following table:

Score	Grade
0-49%	fail (1)
50-59%	pass (2)
60-72%	satisfactory (3)
73-84%	good (4)
85-100%	excellent (5)

If the score of any test is below 50, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

Person responsible for course: Dr. Istvan Grigorszky, associate professor, PhD
Dr. Csaba Berta, Research Assistant fellow, PhD

Lecturer: Dr. Istvan Grigorszky associate professor, PhD
Dr. Csaba Berta, Research Assistant fellow, PhD

Title of course: River Ecology **Code**: TTEMG7005_EN	**ECTS Credit points: 1**

Type of teaching, contact hours

- lecture: -
- practice: 1 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 14 hours
- laboratory: -
- home assignment: 8 hours
- preparation for the exam: 8 hours

Total: 30 hours

Year, semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

This course will introduce students to major conceptual themes in ecology of running waters. . Our goals for this course are to gain an understanding of major physical and biological features of streams and rivers; the range of diversity of running waters around the world; fundamental processes producing patterns of riverine structure and function and critical issues associated with the conservation and management of streams and their biota.

We will study the functional aspects of running waters and its ecological state by comparing natural and human impacted running water types. In the field, we will measure the running water types structure and discharge, sample organisms, and determine water chemistry and the ecological state on the basis of biological, chemical and hydro-morphological characteristics. In the lab, we will identify selected organisms and will learn about adaptation mechanism as regards nutrition, life cycles and resistance to water current.

Literature

Allan J.D. Castillo M.M., (2011) Stream Ecology: Structure and function of running waters, Springer Netherlands,

Michael J. and Mills D., (1990): Freshwater Ecology: Principles and Applications, Wiley-Blackwell,

Giller P.S. (1999): The Biology of Streams and Rivers (Biology of Habitats), Oxford University Press, USA,

APHA (2012): Standard Methods for the Examination of Water and Wastewater, Clearway Logistics Phase 1a;

Schedule:

Lectures:

1st week Physical and chemical attributes of water.

2nd week Order of streamflows.

3rd week Riverbed geology, bedload transport and substrate.

4th week Measuring dissolve oxygen, flow rate, and current speed.

5th week Mountain stream, piedmont river, river plain.

6th week Autochtonous and allochthonous sources of nutrients.

7th week Functional feeding groups (shredders, grazers, collectors, predators).

8th week Space of living.

9th week Oxbow lake, chute, backswamps.

10th week The small streams: rivulet, brooke, rill.

11th week Typical fish species of the zonations.

12th week Presentations I.: the major streams of the students own country.

13th week Presentations II.: the major streams of the students own country or other main tributaries of Danube.

14th week Grade-offering exam.

Requirements:

Practice:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there is one practical test. It can be completed in the 14th week.

The minimum score is 50%. Based on the score of the test, the grade for the test is given according to the following table:

Score	Grade
0-49	fail (1)
50-59	pass (2)
60-72	satisfactory (3)
73-84	good (4)
85-100	excellent (5)

If the score of any test is below 50, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

Person responsible for course: Dr. Istvan Grigorszky, associate professor, PhD
Dr. László Antal, assistant professor, PhD

Lecturer: Dr. Istvan Grigorszky associate professor, PhD
Dr. László Antal, assistant professor, PhD

Title of course: Standing Water Ecology **Code**: TTEME7010_EN	**ECTS Credit points: 2**

Type of teaching, contact hours

- lecture: 2 hours/week
- practice: -
- laboratory: -

Evaluation: exam

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice: -
- laboratory: -
- home assignment: 16 hours
- preparation for the exam: 16 hours

Total: 60 hours

Year, semester: 2nd year, 1 st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The primary objective of this course is to allow the students to become familiar with the scope of standing water ecology and to master its basic facts, principles, concept and fundamental processes.
The course explores the structure and function of standing water types, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals and effects of pollution on organisms and water quality. The laboratory emphasizes modern, hands-on techniques for answering fundamental and applied questions. During the practise/field work the students will learn the qualitative and quantitative techniques for studying lakes, ponds and various standing water types. During the laboratory work the students will identify various aquatic organisms and will learn about adaptation mechanism as regards nutrition, life cycles.

Literature

Kalff J (2001): Limnology. Benjamin and Cummings.
Williams D. D. (2001): The Ecology of Temporary Waters. Blackburn Pr.
Belgrano A., Ulanowicz R. E., Scharler U. M., Dunne J. (2005): Aquatic Food Webs: An Ecosystem Approach, Oxford University Press,
Burk A. R. (2005): Progress In Aquatic Ecosystems Research. Nova Science Pub Inc.

Schedule:

Lectures:

1st week Limnology, Water cycle, habitats, water yields.

2nd week The vertical segmentation of a standing water.

3rd week Standing water typology.

4th week Space of living and physiognomy.

5th week Eutrophication (trophy and trophity).

6th week Halobity.

7th week Saprobity

8th week Toxicity.

9th week Physical parameters of standing waters.

10th week Chemical parameters of standing waters.

11th week Fish communities of standing waters.

12th week Macroinvertebrates of standing waters.

13th week Saline lakes and reservoirs, Lake Balaton "hungarian sea".

14th week Grade-offering exam.

Requirements:
Lecture:

The minimum requirement for the examination is 50% from the midterm and closing tests. Based on the summarized score of the test the grade for the examination is given according to the following table:

Score	Grade
0-49%	fail (1)
50-59%	pass (2)
60-72%	satisfactory (3)
73-84%	good (4)
85-100%	excellent (5)

If the score of any test is below 50, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

Person responsible for course: Dr. Istvan Grigorszky associate professor, PhD

Lecturer: Dr. Istvan Grigorszky associate professor, PhD
Dr. Nagy Sándor associate professor, PhD

Title of course: Standing Water Ecology **Code**: TTEMG7010_EN	**ECTS Credit points: 1**

Type of teaching, contact hours

- lecture: -
- practice: 1 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 14 hours
- laboratory: -
- home assignment: 8 hours
- preparation for the exam: 8 hours

Total: 30 hours

Year, semester: 2nd year, 1 st semester

Its prerequisite(s): -

Further courses built on it: -

Topics of course

The primary objective of this course is to allow the students to become familiar with the scope of standing water ecology and to master its basic facts, principles, concept and fundamental processes.

The course explores the structure and function of standing water types, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals and effects of pollution on organisms and water quality. The laboratory emphasizes modern, hands-on techniques for answering fundamental and applied questions. During the practise/field work the students will learn the qualitative and quantitative techniques for studying lakes, ponds and various standing water types. During the laboratory work the students will identify various aquatic organisms and will learn about adaptation mechanism as regards nutrition, life cycles.

Literature

Kalff J (2001): Limnology. Benjamin and Cummings.
Williams D. D. (2001): The Ecology of Temporary Waters. Blackburn Pr.
Belgrano A., Ulanowicz R. E., Scharler U. M., Dunne J. (2005): Aquatic Food Webs: An Ecosystem Approach, Oxford University Press,
Burk A. R. (2005): Progress In Aquatic Ecosystems Research. Nova Science Pub Inc.

1. Padisák, J (2005): Általános limnológia, ELTE Eötvös Kiadó.

Schedule:

Lectures:

1st week Division of the different habitats and water yields. All of the student's need to recognize 10 different habitat and water yield, in case of an example.

2nd week Have to distinguish the different parts of the water body. Discussion about their functions.

3rd week Division of the Hungarian standing water types. Every student need to differentiate 10 water body.

4th week Space of living and their main organisms.

5th week Isolation of the different types of eutrophication and their main consequences. All of the students need to discuss about the trophy.

6th week Categorization of an example water body based on halobity.

7th week Categorization of an example water body based on saprobity.

8th week Categorization of an example water body based on toxicity.

9th week Analysing water bodies with data series. Monomythic, dimictic, polymictic, oligomictic, amictic lakes.

10th week Measurement of different chemical parameter of a standing water.

11th week Analyses of characteristic fish groups of standing water on the basis of data series and their water quality aspects.

12th week Analyses of typical macroinvertebrates community of standing waters on the basis of data series and their water quality aspects.

13th week Investigation of the physical, chemical and biological characteristics that characterize the different water quality status of water bodies.

14th week Grade-offering exam.

Requirements:

Practice:

Participation at classes is compulsory. A student must attend the courses and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

During the semester there is one practical test. It can be completed in the 14th week.

The minimum score is 50%. Based on the score of the test, the grade for the test is given according to the following table:

Score	Grade
0-49	fail (1)
50-59	pass (2)
60-72	satisfactory (3)
73-84	good (4)
85-100	excellent (5)

If the score of any test is below 50, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

Person responsible for course: Dr. Istvan Grigorszky associate professor, PhD

Lecturer: Dr. Istvan Grigorszky associate professor, PhD
Dr. Nagy Sándor associate professor, PhD

Title of course: Evolutionary Biology **Code**: TTEMG7015_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture: -
- practice: 42 hours/week
- laboratory: -

Evaluation: mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: -
- practice: 42 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the presentation: 24 hours

Total: 90 hours

Year, semester: 2st year, 1st semester

Its prerequisite(s):

Further courses built on it:

Topics of course

The Modern Synthesis of evolutionary biology. Evolution basics. Levels of selection. Evolution of individuality. Evolutionary conflicts. Genome evolution. Evolution of genetic regulatory systems. Evolution of development. Phenotypic plasticity and evolution of reaction norms. Epigenetics and evolution. Evolution of sex. Phylogenetics. Evolution of biodiversity. Darwinian medicine: evolution of pathogens, antimicrobial resistance, cancer.

Literature

Futuyma, D. J. & Kirkpatrick, M. (2017). Evolution 4th Ed. Sinauer

Maynard Smith, J & Szathmáry, E. (1995). The major transitions in evolution. Oxford University Press.

Buss, L. W. (1988). The evolution of individuality. Princeton University Press.

West-Eberhard, M. J. (2003). Developmental plasticity and evolution. Oxford University Press

Ewald, P. W. (1994) Evolution of infectious disease. Oxford University Press

Burt, A. & Trivers, R (2008). Genes in conflict. Harvard University Press

Schedule:

1st week

The Modern Synthesis of evolutionary biology.

2nd week

Evolution basics.

3rd week

Levels of selection.

4th week

Evolution of individuality.

5th week

Evolutionary conflicts.
6th week
Genome evolution.
7th week
Evolution of genetic regulatory systems.
8th week
Evolution of development.
9th week
Phenotypic plasticity and evolution of reaction norms.
10th week
Epigenetics and evolution.
11th week
Evolution of sex.
12th week
Phylogenetics.
13th week
Evolution of biodiversity.
14th week
Darwinian medicine: evolution of pathogens, antimicrobial resistance, cancer.

Requirements:

Participation at the classes is compulsory. A student may not miss more than three lectures during the semester. In case a student does so, the subject will not be signed and the student must repeat the course.

The minimum requirement for the exam 60%. Grades are given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

Person responsible for course: Dr. Jácint Tökölyi, Associate Professor, PhD

Lecturer: Dr. Jácint Tökölyi, Associate Professor, PhD

Title of course: Grassland ecology **Code**: TTEME8001_EN / TTEMG8001_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture:2 hours/week
- practice:1 hours/week
- laboratory: -

Evaluation: exam, mid-semester grade

Workload (estimated), divided into contact hours:

- lecture: 28 hours
- practice:14 hours
- laboratory: -
- home assignment: 24 hours
- preparation for the exam: 24 hours

Total: 90 hours

Year, semester: 1st year, 2nd semester

Its prerequisite(s):-

Further courses built on it:-

Topics of course

The course will give a comprehensive overview about the ecology of grassland ecosystems. First, the most important characteristics of grasslands will be discussed, with a special focus on environmental characteristics of the habitats, site conditions, productivity, food webs, herbivore guilds. Second, students will get known the major stress and disturbance factors that shape the habitat structure in grasslands. Finally, the basics of grassland conservation projects will be discussed, with a special focus on grassland management by grazing, mowing or burning. The effects of conservation measures and abandonment will be highlighted by case studies from different parts of the world.

Literature

- Du Toit, J. T., Kock, R., & Deutsch, J. (Eds.). (2012). Wild rangelands: conserving wildlife while maintaining livestock in semi-arid ecosystems. John Wiley & Sons.
- Valkó O: Current issues in ecology and conservation of grasslands. In Simon, E., Tóthmérész, B., Török, P., Valkó, O. (Eds): Ecology and Environmental Conservation. TÁMOP-4.1.2.D-12/1/KONV-2012-0008 „Szak-nyelv-tudás" - Az idegen nyelvi képzési rendszer fejlesztése a Debreceni Egyetemen.
- Squires V.R., Dengler J., Feng H., Hua L. (Ed.) (2018): Grasslands of the world: diversity, management and conservation. Boca Raton; New York: CRC Press.

Schedule:

1st week Introduction to the course

2nd week Grassland types in the world: biomes, azonal and extrazonal grasslands.

3rd week Grassland types in Europe 1: steppes, forest-steppes

4th week Grassland types in Europe 2: azonal and extrazonal grasslands.

5th week Grassland types in Europe 3: semi-natural grasslands

6th week Grasslands as biodiversity hotspots

7th week: Mid-term test

8th week: Plant functional types and primary production in global grasslands.

9th week: The role of herbivores in maintaining the diversity in grasslands.

10th week: Threatening factors of grassland ecosystems

11th week: Conservation of grasslands – grazing, mowing, burning

12th week: Restoration of grasslands

13th week: LIFE Nature for grassland conservation.

14th week End-term test

Requirements:

- for a signature
Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade
The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Prof. Péter Török, university professor, DSc

Lecturer: Prof. Péter Török, university professor, DSc

Title of course: Project and grant proposal writing **Code**: TTEME8005_EN / TTEMG8005_EN	**ECTS Credit points: 3**

Type of teaching, contact hours

- lecture:1 hours/week
- practice:2 hours/week
- laboratory: -

Evaluation: exam, mid-semester

Workload (estimated), divided into contact hours:

- lecture: 14hours
- practice: 28hours
- laboratory: 0 hours
- home assignment: 30 hours
- preparation for the exam: 8 hours

Total: 90 hours

Year, semester: 2nd year, 2nd semester

Its prerequisite(s):-

Further courses built on it:-

Topics of course

The primary objective of the course is to allow students to become familiar with proposal writing and management of nature- and environmental conservation grants and projects. First we will overview the types of funding possibilities, the major funding institutes, and important electronic forums where funding opportunities can be found. Second, the basics of proposal writing and project planning will be discussed, with a special focus on eligibility criteria, research plan, action plan, budget plan and milestones. Examples of successful projects will help students to acquire skills which are necessary for proposal writing. After getting familiar with the basics of proposal writing, students will prepare their own conservation-related proposal. The proposals will be evaluated and discussed in groups. During this course, student will learn how to write a proposal, how to find funding opportunities for conservation projects and how to manage and report projects.

Literature

- Alexander, M. 2008: Management Planning for Nature Conservation. A Theoretical Basis & Practical Guide. Springer Netherlands, pp. 426.
- IUCN World Commission on Protected Areas, International Union for Conservation of Nature, Natural Resources, IUCN World Commission on Protected Areas. Financing Protected Areas Task Force, University of Wales. College of Cardiff. Department of City, Regional Planning & Natural Resources. Economics Service Unit. (2000). Financing protected areas: Guidelines for protected area managers (No. 5). IUCN.

Schedule:

1st week Introduction to the course

2nd week Motivations for grant writing, types of scientific and conservation grants

3rd week Major types of scientific grants

4th week Major types of conservation grants

5th week Baseline structure of the grants

6th week Basics of proposal writing

7th week: Mid-term test

8th week Scientific / conservation rationelle, core project idea

9th week Significance and importance of the project

10th week Detailed workplan

11th week Budget plan

12th week Project outcomes and deliverables

13th week Project management and reporting

14th week End-term test

Requirements:

- for a signature

Participation at classes is compulsory. A student must attend the classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. In case of more than three absences, a medical certificate needs to be presented.

-an offered grade:

During the semester there are two tests: the mid-term test in the 7th week and the end-term test in the 14th week. The offered grade is the average of them.

The minimum requirement for the tests (and also for the examination) is 60%. The grade for the tests and the examination is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

- for a grade

The course ends in a written exam. For the grades please refer the table above.

Person responsible for course: Prof. Péter Török, university professor, DSc.

Lecturer: Prof. Péter Török, university professor, DSc