

**THE DOCTORAL TRAINING PROGRAMME OF THE DOCTORAL SCHOOL OF
ENVIRONMENTAL SCIENCES
2021**

PhD/DLA students and doctoral candidates who started their doctoral training programmes or the procedures for obtaining a doctoral degree before 1 September 2016 shall fall under the rules pursuant to the provisions of the regulations entering into force on 1 January 2016.

The doctoral training programme of the Doctoral School of Environmental Sciences is based on the regulations governing the doctoral training programmes and the awarding of the doctoral degree (please visit the website of the University of Szeged: https://www2.sci.u-szeged.hu/chem/phd_chem/KDIfiles/SZTE_KDI_credits-requirements-2019.pdf)

Rules of the PhD program

At the Doctoral School, a credit system that conforms to the higher-level regulations ensures that the principle of unity is met.

4.1. In doctoral education, all study requirements are defined in credits (credits). The grading of the examination shall be on a 3-level or 5-level grading scale.

4.2. The duration of the doctoral studies is 2+2 years, divided into 8 semesters. In the first two years the students take courses and do research as well and collect min. 120 credits. At the end of this part there is a so-called complex examination. If the complex examination is successful, the student can enter to the next two years. In this part there are no courses, only research work must be done. Normally, at the end of this period the dissertation should be completed and the defense process can be started. During the 48-month-long training period – divided into 8 examination periods – a total of 240 credit points shall be earned to be eligible for a completion of studies certificate.

4.3. At least 20 and at most 45 credit points shall be collected during each examination period..

4.4. If a student participates in a partial study at a foreign or other Hungarian university, the relevant Doctoral School Council may grant exemption from the above-mentioned requirements. The credit point value of the courses that had been completed at a foreign or other Hungarian university shall be judged by the relevant Doctoral School Council.

4.5. The credit point value of the theoretical course with two lessons per week (14 weeks/semester) shall be 3-6 points. The credit point value shall change in proportion with the change in the total number of lessons i.e. taking an intensive course with an external lecturer. At least **15** credits points shall be achieved from the theoretical courses, which means that min. 5 courses (2 h /week, 5-level grading scale) have to be achieved during the first periode (1-4. Semester) of the PhD study (this is one of the criteria for taking the exam). In the second part of the PhD study (dissertation period 5-8 smester) there are no theoretical courses, only research work must be done.

4.6. The educational responsibilities of the Doctoral School of Environmental Sciences are divided into six disciplines (Environmental Biochemistry and biotechnology, Conservation Ecology, Environmental Geography, Environmental Geology, Environmental Chemistry and Analysis, Environmental Chemical Technology and Materials Science, Environmental engineering and Environmental Physics Program). PhD students has to choose theoretical courses by the following way:

a) Minimum 9 credits (3 theoretical courses) must be taken from courses offered by Phd student's discipline, from the block of the Program in which the student is studying
The courses are grouped into the following blocks by training program

Environmental Biochemistry and biotechnology

Conservation Ecology

Environmental Geography

Environmental Geology

Environmental Chemistry (courses of the Environmental Chemistry and Analysis, Environmental Chemical Technology and Materials Science, Environmental engineering programs)

Environmental Physics

b) Minimum 6 credits (2 theoretical courses) can be taken from any courses offered by Doctoral School of Environmental Sciences or other Phd courses offered by the Doctoral Schools of Biology, Physics, Chemistry, Earth Sciences of the University of Szeged.

c) The credit point value of the courses that had been completed at a foreign or other Hungarian university shall be judged by the relevant Doctoral School Council.

4.7. The number of credits can be collected by an educational activity depends on the number of hours of teaching activity:

1 h/week: 2 credits.

2 h/week: 4 credits.

3 h/week: 6 credits.

4 h/week: 8 credits.

A total of 48 credits and a maximum of 8 credits per semester can be obtained via education activity.

4.8. With research work such as bibliography, library and archives research, follow-up on journal articles, conference participation –where the student presents a poster or holds a lecture –and publishing articles in journals a total of at least 130 credit points shall be achieved:

Labwork (20 credits, 20 h/week): research work related to the PhD topic of the PhD student, bibliography, library and archives research, follow-up on journal articles.

Working report (4 credits): The doctoral student may report on his research work at a department or research group seminar. Maximum 4 reports can be evaluated with credit.

Conference presentation (poster or oral) A doctoral student may receive credit for his active conference presentations (posters), provided that they appear in the conference publication. The number of credits is as follows:

	Hungarian (local conf., official language is Hungarian))	International (official language is English)
poster	1 credit	2 credits
oral	3 credits	5 credits

Publication (5 credits) The doctoral students shall gain credit points for international journal articles.

The doctoral student needs to be co-author of at least 2 publications related to the topic of PhD dissertation, published in international scientific journals referred by the SCI (Science Citation Index). In one of the papers the student has to be the first author. The applicant is not the first author, then the corresponding author has to declare the contribution of the student to the publication. If the topic of the dissertation covers R&D activity, 1 publication is required.

Summer School (3 credits) the doctoral student may attend a summer university or summer school related to the topic of the dissertation. The program leader decides on the approval of the given summer school.

Study abroad – short (3 credits) The doctoral student may take a short study trip abroad (min. 2 weeks - max. 1 month) related to the topic of the dissertation. Verification of the study visit has to be given by supervisor, while acceptance by the program manager.

Study abroad – long (5 credits) The doctoral student may take a short study trip abroad (min. a month - max. 2 months) related to the topic of the dissertation. Verification of the study visit has to be given by supervisor, while acceptance by the program manager.

5. Complex exam / comprehensive examination

All students admitted after 2016 must take a Complex Exam at the end of the 4th semester. The prerequiremnts of the Complex Exam :

- 15 credits points from the theoretical courses (4.6.)
- 120 credits collected by the end of the 4th semester

This exam has two parts. The first part encompasses a regular exam from two subject (major and minor question). In the second part, the student summarizes the research achievements done already, and outlines the work planned for the next two years.

Chapter V of the regulations of the University of Szeged on doctoral and doctoral studies contains detailed information about the organization of the complex exam. The the study part of the failed complex exam can be repeated once in the same exam period. The section on research advancement cannot be repeated. If the exam is unsuccessful, the PhD training will be terminated.

6. Knowledge of foreign languages

The applicant needs to have two certified knowledge in two foreign languages. Equivalence between language examinations is regulated by a Government Decree. Cases that are not regulated by the Government Decree fall under the authority of the University's Foreign Language Centre. The expert opinion of the Centre shall be decisive. One language shall be English (B2 level or equivalent). The second language exam shall be B1 level. The second language exam shall be German, France, Italian or Russian. For foreign students whose native language is not Hungarian, their mother tongue or any other language shall be accepted as a fulfilment of the language requirements, providing that there are scientific publications written by this language on the field of Environmental Sciences. For foreign nationals, who are not native Hungarian speakers, Hungarian language counts as a foreign language.

7. Dissertation

The language of the dissertation is either Hungarian or English. The dissertation shall be descriptive and shall not be more than 100 pages. It shall contain the background and motivation of the research, together with the description of the experimental methods used during the work. Is shall contain a detailed results and discussion section, which presents all the important outcome of the doctoral research. A booklet of Thesis points has to be also compiled. This contains the aims, experimental, and the most important outcomes, summarized in bullet points. The length of the booklet shall be 10-15 pages. All relevant publications have to be listed, together with the relevant conference presentations of the applicant. The IF values have to be shown, and they shall be

summarized. The cover page shall contain the name of the applicant, the supervisor, and the doctoral school. The Dissertation and the Booklet of Thesis Points both have to be uploaded into the Repository of the University. **Before** submitting the Dissertation, the applicant has to present his thesis to an expert audience. This can be either the Department where the research work has been carried out, or the relevant body of the Hungarian Academy of Sciences. The audience has to give a written supportive opinion that the content of the Dissertation is suitable to submit it. The Supervisor also has to declare in a written form that the application is capable of receiving a scientific degree.

8. Programs of the Doctoral School of Environmental Sciences:

- 7.1. Environmental Biochemistry and biotechnology (Dr. Gábor Rákhely)
- 7.2. Conservation Ecology (Dr. Zsolt Péntes)
- 7.3. Environmental Geography (Prof. Dr. János Rakonczai)
- 7.4. Environmental Geology (Dr. Elemér Pál-Molnár)
- 7.5. Environmental Physics (Prof. Dr. Zoltán Bozóki)
- 7.6. Environmental Chemistry and Analysis (Prof. Dr. Pál Sipos)
- 7.7. Environmental Chemical Technology and Materials Science (Prof. Dr. Zoltán Kónya)
- 7.8. Environmental engineering and Program (Prof. Dr. Cecília Hodúr)

The actual research topics can be found on the webpage of the Doctoral School (<http://www.sci.u-szeged.hu/karunkrol/kornyezettudomanyi/kornyezettudomanyi-doktori-iskola/bemutakozas>) and on the official webpage of the Doctoral Council (www.doktori.hu).

Theoretical Courses of the Doctoral School of Environmental Sciences-2019

	title	teacher		credit	h/weekt
<i>Environmental Biochemistry and biotechnology</i>					
	Basic Biotechnology I.	Kovács Kornél		3	2
	Basic Biotechnology II.	Rákhely Gábor-		3	2
	Molecular Biotechnology	Tóth András		3	2
	Basic Biochemistry	Hermesz Edit Kotormán Márta		3	2
	Biochemistry for Chemists	Kiricsi Mónika		3	2
	Biotechnology of Waste treatment	Perei Katalin		3	2
	Biotechnology of winery	Tóth András		3	2
	Application of Cyanobacteria in Biotechnology	Gombos Zoltán		3	2
	Nitrate Removal by Biotechnology	.Kesserû Péter Kiss István		3	2
	Biotechnology in business	Ifj. Duda Ernő		3	2
	Methods for investigation of Protein structures	Borics Attila		3	2
	Environmental Stress Biology	Hermesz Edit		3	2
	Stress Biology	Hermesz Edit		3	2
	Advanced Biochemistry	Hermesz Edit Kotormán Márta		3	2
	MATLAB	Groma Géza		3	2
<i>Conservation Ecology</i>					
	Population biology	Pénzes Zsolt		3	2
	Conservation biology	Bátori Zoltán		3	2
	Elementary interactions and the ecology of communities	Torma Attila		3	2
	Phylogenetics	Pénzes Zsolt		3	2
	Phytosociology .	Tölgyesi Csaba		3	2
	Population genetics	Pénzes Zsolt		3	2
	Entomology	Torma Attila		3	2
	Molecular ecology	Pénzes Zsolt		3	2
<i>Environmental Geography</i>					
	Physical Geography	Kiss Tímea		3	2
	Global Envinronmental Problems	Rakonczai János		3	2
	Pedology	Farsang Andrea		3	2
	Hydrogeography, hydrogeology	Barta Károly		3	2
	Impacts and consequences of Global Environmental Changes in Hungary	Rakonczai János		3	2
	Environmental monitoring	Farsang Andrea		3	2

	Introduction to Geographical Information Systems	Mucsi László		3	2
	Geomorphology	Kiss Tímea		3	2
	Biogeography and Geography of soils	Gulyás Ágnes Barta Károly		3	2
	Urban ecology	Mucsi László		3	2
	Urban climate	Unger János		3	2
	Landscape ecology	Gulyás Ágnes Takács Eszter		3	2
	Quaternary Geography	Sipos György		3	2
	Geophysical methods in the evaluation of the environment			3	2
	Recent problems of Hyrogeography in Hungary	Rakonczai János		3	2
	Soil and groundwater protection	Farsang Andrea		3	2
	Environmental protection in practice	Ladányi Zsuzsanna		3	2
	Spatial models in earth sciences	Szutmári József		3	2
	Big Data - Data mining for geoinformatics	Szutmári József			
	GIS modelling	Szutmári József		3	2
	Environmental conditions of Hungary	Ladányi Zsuzsanna		3	2
	GIS databases	Kovács Ferenc		5	4
	GIS	Kovács Ferenc		5	4
	Soil erosion modelling	Barta Károly		3	2
	GIS Fieldwork	Tobak Zalán, Boudewijn van Leeuwen		3	2
	Application of GIS and RS in Earth Sciences	Tobak Zalán, Boudewijn van Leeuwen		3	2
	Drought and soils	Barta Károly		3	2
	Landscape Planning (Tájtervezés)	Szilassi Péter és Ladányi Zsuzsanna		3	2
	Environmental Risk Assessment	Ladányi Zsuzsanna		3	2
<i>Environmental Chemistry</i>					
	Environmental Chemistry	Kónya Zoltán Tóth Ildikó		3	2
	Analytical Chemistry of Environmental Protection	Alapi Tünde		3	2
	Advanced Analytical Chemistry of Environmental Protection	Alapi Tünde		3	2
	Waste treatment and Waste management	Kozma Gábor Sápi András		3	2
	Environmental Colloid Chemistry	Tombácz Etelka		3	2
	Atomic Spectroscopy	Galbács Gábor		3	2
	Advanced Oxidation Processes for Environmental Protection	Alapi Tünde		3	2
	Bioengineering Operations	Hodúr Cecília		3	2

	Membran Separation Processes	Hodúr Cecília		3	2
	Environmental Techniques	László Zsuzsanna		3	2
	Technology of Environmental Protection	Kozma Gábor Sápi András		3	2
	Chemistry of Zeolits and Mesoporous Materials	Hannus István		3	2
	Advanced Water Treatments	Tóth Ildikó		3	2
	Alternative energy sources	Hannus István		3	2
	Nanotechnology for Environmental Protection	Kónya Zoltán		3	2
	Air pollution, air protection	Kozma Gábor Sápi András		3	2
	Equilibrium on interface and colloid stability of dispersions in aqueous medium	Tombácz Etelka		3	2
	Surface Chemistry and heterogeneous catalysis 1.	Dékány Imre, Erdőhelyi András, Kiss János		3	2
	Surface Chemistry and heterogeneous catalysis 2.	Dékány Imre, Erdőhelyi András, Kiss János		3	2
	Advanced technologies of waste treatment	Kukovecz Ákos		3	2
	Case studies in Industrial catalysis	Kukovecz Ákos		3	2
<i>Environmental Geology</i>					
	Topics in Mineralogy	Pál-Molnár Elemér		3	2
	Topics in Petrology	M. Tóth Tivadar		3	2
	Topics in Sedimentology	Geiger János		3	2
	Secondary sampling and geostatistical analysis of spatio-temporal monitoring systems	Geiger János		3	2
	General Geology	Sümegei Pál		3	2
	Environmental Geology	M. Tóth Tivadar Sümegei Pál		3	2
	Environmental Geochemistry	Hetényi Magdolna		3	2
	Applied Palaeoecology	Sümegei Pál		3	2
	Mineralogy and Petrology	Pál-Molnár Elemér M. Tóth Tivadar		3	2
	Geology of Hungary	Sümegei Pál Raucsik Béla		3	2
	Applied Environmental Geology	M. Tóth Tivadar Sümegei Pál		3	2
	Laboratory and Field Methods in Environmental Geology	Bozsó Gábor Sümegei Pál		3	2
	Környezeti Geokémia Environmental Geochemistry	Hetényi Magdolna		3	2
	Petrography and Geochemistry of Siliciclastic Rocks	Raucsikné Varga Andrea		3	2

	Water-Rock Interactions - Diagenesis	Raucsikné Varga Andrea		3	2
	Hydrogeology	Szanyi János		3	2
	Numerical modelling	Szanyi János és Kovács Balázs		3	2
	Topics in Clay Mineralogy	Raucsik Béla		3	2
	Applied Isotope Geochemistry	Raucsikné Varga Andrea és Raucsik Béla		3	2
	Geological mapping	Geiger János M. Tóth Tivadar		3	2
	Applied Geomathematics and Geostatistics	Geiger János M. Tóth Tivadar		3	2
	Geological fundamentals of waste deposition	Sümegi Pál M. Tóth Tivadar		3	2
	Geological fundamentals of environmental protection	Sümegi Pál		3	2
	Environmental Mineralogy	Pál-Molnár Elemér Bozsó Gábor		3	2
	Organic Matter in Soils and Recent Sediments	Hetényi Magdolna		3	2
	Numerical modelling of fractured fluid reservoirs	M. Tóth Tivadar		3	2
<i>Environmental Physics</i>					
	Applied Optics	Erdélyi Miklós		3	2
	Biophysics	Maróti Péter		3	2
	Scientific Communication	Szörényi Tamás		3	2
	Photoacoustic Spectroscopy	Bozóki Zoltán		3	2
	Technology of Virtual Measurements	Mingesz Róbert		3	2
	Geophysical fluid dynamics	Bozóki Zoltán		3	2
	Microphysics and chemistry of clouds	Szakáll Miklós		3	2
	Environmental Physics of aerosols in atmosphere	Ajtai Tibor		3	2
<i>Courses suggested for each PhD student</i>					
	Biomarkers of environmental hazards	Papp András		3	2
	Health problems caused by xenobiotics	Nagymajtényi László		3	2
	Quality Protection	Lászlóné Dr. Gálfi Márta		3	2
	Life-cycle Analysis	Lászlóné Dr. Gálfi Márta		3	2
	LabVIEW for analysis of the measurements	Tátrai Dávid		3	2
	Complex architectures in LabVIEW	Tátrai Dávid		3	2