

**ELTE Eötvös Loránd University – Faculty of Science
HEVESY GYÖRGY PHD SCHOOL OF CHEMISTRY
FOUR-YEAR TRAINING PROGRAM**

Discipline: science

Form of education: PhD training

Objectives of the Program: acquire higher-level academic training and the skills necessary in research, development, innovation, and higher-level education

Length of training: 8 semesters

Training type: regular school

Financing: state sponsored or tuition-fee based

Entrance requirements: MSc and a successful entrance exam

Language requirements: a type „C” secondary (or equivalent) language exam in English recognized by the state (entrance requirement) and a basic-level second language exam of similar status (exit requirement)

Training phases: First two years (period I): 120 ECTS credits, finished with a Complex exam; Last two years (period II): 120 ECTS credits, finished with an absolutorium

Number of ECTS credits required: 240

Moduls of ECTS credits: training credit (I: 36-48; II: 0), research credit (I: 60, II: 114), and teaching credit (I: 0-12, II: 0), report days (I:12, II:6)

Person responsible for the training: Dr. Attila G. Császár, professor of chemistry, head of the PhD School

DOCTORAL SCHOOL’S EDUCATION PROGRAMS

I. SYNTHETIC, ORGANIC, AND BIOMOLECULAR CHEMISTRY

Director of the program: Prof. Dr. András Perczel

II. THEORETICAL, PHYSICAL, AND STRUCTURAL CHEMISTRY

Director of the program: Prof. Dr. Péter Surján

III. ANALYTICAL CHEMISTRY, MATERIALS SCIENCE, ELECTROCHEMISTRY, COLLOIDAL, AND ENVIRONMENTAL CHEMISTRY

Director of the program: Prof. Dr. Imre Salma

Compulsory courses:

KÉM/REP1 Report Day
6 credits, practice, optional, no repetition (during the 2nd semester)

KÉM/REP2 Report Day
6 credits, practice, optional, no repetition (during the 4th semester)

KÉM/REP3 Report Day
6 credits, practice, optional, no repetition (during the 6th semester)

KÉM/RES1 Supervised research
15 credits, practice, optional, no repetition (during the 1st semester)

KÉM/RES2 Supervised research
15 credits, practice, optional, no repetition (during the 2nd semester)

KÉM/RES3 Supervised research

	15 credits, practice, optional, no repetition (during the 3rd semester)
KÉM/RES4	Supervised research 15 credits, practice, optional, no repetition (during the 4th semester)
KÉM/RES5	Supervised research 30 credits, practice, optional, no repetition (during the 5th semester)
KÉM/RES6	Supervised research 24 credits, practice, optional, no repetition (during the 6th semester)
KÉM/RES7	Supervised research 30 credits, practice, optional, no repetition (during the 7th semester)
KÉM/RES8	Supervised research 30 credits, practice, optional, no repetition (during the 8th semester)

The dissertation part of the Complex exam includes a lecture presented on the Report Day of the PhD School. The theoretical part of the Complex exam has two components, a compulsory and an optional. The compulsory component of the theoretical part of the Complex exam is a „Proposal writing” on a selected subject, following a given form. The topic of the proposal should not be related directly to the actual research project of the doctoral candidate. Out of the three topics offered by the doctoral candidate the director of the given program chooses the one to elaborate. The optional component of the theoretical part of the Complex exam is a topic selected from the following list:

SYNTHETIC, ORGANIC, AND BIOMOLECULAR CHEMISTRY PROGRAM

1. Organic chemistry
2. Inorganic chemistry
3. Polymer chemistry

THEORETICAL, PHYSICAL, AND STRUCTURAL CHEMISTRY PROGRAM

1. Physical chemistry
2. Methods of structure analysis
3. Theoretical chemistry

ANALYTICAL CHEMISTRY, MATERIALS SCIENCE, ELECTROCHEMISTRY, COLLOIDAL, AND ENVIRONMENTAL CHEMISTRY

1. Analytical chemistry
2. Electrochemistry
3. Colloidal chemistry
4. Nuclear chemistry
5. Environmental chemistry

Training modul (credits to be obtained: 48):

Optional courses:

KÉM/TEACH1	Teaching activity 6 credits, practice, optional, can not be repeated
KÉM/TEACH2	Teaching activity 6 credits, practice, optional, can not be repeated
KÉM/201	Computational statistical mechanics András Baranyai 6 credits, theory, optional, no repetition
KÉM/206	Ring transformations in heterocyclic chemistry Antal Csámpai

KÉM/207	6 credits, theory, optional, no repetition Quantum chemistry and structural determinations Attila G. Császár 6 credits, theory, optional, no repetition
KÉM/208	Quantum mechanics of molecular motions Attila G. Császár 6 credits, theory, optional, no repetition
KÉM/210	Interfacial behaviour of macromolecules Ferenc Csempesz 6 credits, theory, optional, no repetition
KÉM/212	Quantum chemical molecular modeling Ödön Farkas 6 credits, theory, optional, no repetition
KÉM/215	Electrostatic interactions in colloid systems Tibor Gilányi 6 credits, theory, optional, no repetition
KÉM/216	Self-association of surfactants in solution Tibor Gilányi 6 credits, theory, optional, no repetition
KÉM/218	Heteroaromatic chemistry Antal Csámpai and Szilárd Varga 6 credits, theory, optional, no repetition
KÉM/223	Bioconjugates Ferenc Hudecz 6 credits, theory, optional, no repetition
KÉM/224	Selected chapters of peptide and protein chemistry Ferenc Hudecz 6 credits, theory, optional, no repetition
KÉM/226	Theoretical electrochemistry György Inzelt 6 credits, theory, optional, no repetition
KÉM/227	Basics of macromolecular technology Béla Iván 6 credits, theory, optional, no repetition
KÉM/228	Principles of molecular engineering of macromolecules Béla Iván 6 credits, theory, optional, no repetition
KÉM/230	Chromatographic separation of enantiomers Zoltán Juvancz 6 credits, theory, optional, no repetition
KÉM/232	Basic neurochemistry Julianna Kardos 6 credits, theory, optional, no repetition
KÉM/233	Methods of applied statistics Erő Keszei 6 credits, theory, optional, no repetition
KÉM/234	Modern reaction kinetics Erő Keszei 6 credits, theory, optional, no repetition

KÉM/235	Surface chemistry of biomaterials Éva Kiss 6 credits, theory, optional, no repetition
KÉM/239	Organometallic compounds in the organic synthesis András Kotschy 6 credits, theory, optional, no repetition
KÉM/240	Modern synthetic methods András Kotschy 6 credits, theory, optional, no repetition
KÉM/241	Theoretical background of experimental electrochemistry Győző Láng 6 credits, theory, optional, no repetition
KÉM/242	Introduction to the theory of elementary reaction kinetics György Lendvay 6 credits, theory, optional, no repetition
KÉM/246	Shape, similarity and complementarity of molecules Pál Mezey 6 credits, theory, optional, no repetition
KÉM/247	Preparation of cyclo- and oligopeptides Gábor Mező 6 credits, theory, optional, no repetition
KÉM/248	Colloid Chemistry of network structures Miklós Nagy 6 credits, theory, optional, no repetition
KÉM/249	Molecular modelling Gábor Náray-Szabó 6 credits, theory, optional, no repetition
KÉM/250	Oscillation and other dynamic phenomena in chemistry Miklós Orbán 6 credits, theory, optional, no repetition
KÉM/251	Structure elucidation of peptides and proteins by NMR spectroscopy András Perczel 6 credits, theory, optional, no repetition
KÉM/252	Bio-NMR pulse sequences András Perczel 6 credits, theory, optional, no repetition
KÉM/253	GC and HPLC in the analysis of organic compounds Ibolya Perlne Molnár 6 credits, theory, optional, no repetition
KÉM/254	Methods of quantum chemistry Gábor Pongor 6 credits, theory, optional, no repetition
KÉM/255	Modern methods of quantum chemistry Gábor Pongor 6 credits, theory, optional, no repetition
KÉM/256	Disorder in condensed phases László Pusztai 6 credits, theory, optional, no repetition

KÉM/257	Organofluorine chemistry József Rábai 6 credits, theory, optional, no repetition
KÉM/258	Methods of surface examination Miklós Riedel 6 credits, theory, optional, no repetition
KÉM/260	Physical organic chemistry Elemér Vass 6 credits, theory, optional, no repetition
KÉM/261	Instrumental nuclear methods applied in environmental analysis Imre Salma 6 credits, theory, optional, no repetition
KÉM/265	Theoretical study of protein structures István Simon 6 credits, theory, optional, no repetition
KÉM/266	Applied NMR spectroscopy Andrea Bodor 6 credits, theory, optional, no repetition
KÉM/268	Mathematical methods in quantum chemistry. I Péter Surján 6 credits, theory, optional, no repetition
KÉM/269	Mathematical methods in quantum chemistry. II Péter Surján 6 credits, theory, optional, no repetition
KÉM/272	Modern methods of quantum chemistry Péter Szalay 6 credits, theory, optional, no repetition
KÉM/274	Application of photoionization in spectroscopy László Szepes 6 credits, theory, optional, no repetition
KÉM/275	Organometallic chemistry Roland Szalay 6 credits, theory, optional, no repetition
KÉM/277	Investigation of metal corrosion by electrochemical methods Laura Sziráki 6 credits, theory, optional, no repetition
KÉM/278	Asymmetric synthesis Géza Timári 6 credits, theory, optional, no repetition
KÉM/279	Applied gas chromatography Zsuzsanna Eke 6 credits, theory, optional, no repetition
KÉM/280	Separation techniques in organic chemistry Zsuzsanna Eke 6 credits, theory, optional, no repetition
KÉM/281	Environmental and health effects of energy production Szabina Török 6 credits, theory, optional, no repetition

KÉM/282	Combustion chemistry and physics Tamás Turányi 6 credits, theory, optional, no repetition
KÉM/283	Investigation of reaction mechanisms Tamás Turányi 6 credits, theory, optional, no repetition
KÉM/284	Applied computer simulations László Túri 6 credits, theory, optional, no repetition
KÉM/285	Elementary reaction dynamics László Túri 6 credits, theory, optional, no repetition
KÉM/286	Mass spectrometry II. László Drahos 6 credits, theory, optional, no repetition
KÉM/287	Nuclear techniques in material science Zoltán Homonnay 6 credits, theory, optional, no repetition
KÉM/288	Analytical application of plasma spectroscopy Gyula Záray 6 credits, theory, optional, no repetition
KÉM/289	Environmental analysis Gyula Záray 6 credits, theory, optional, no repetition
KÉM/290	Enrichment methods in atomic spectroscopy Katalin Perényi 6 credits, theory, optional, no repetition
KÉM/292	Vacuum techniques Dávid Frigyes 6 credits, theory, optional, no repetition
KÉM/293	Basic and applied quantum chemistry Ágnes Szabados 6 credits, theory, optional, no repetition
KÉM/296	Photophysics and photochemical kinetics Attila Demeter 6 credits, theory, optional, no repetition
KÉM/298	Cyclodextrins in nanotechnology Éva Fenyvesi 6 credits, theory, optional, no repetition
KÉM/299	Computer-aided drug design György Keserű 6 credits, theory, optional, no repetition
KÉM/301	Mass spectrometry of biomolecules Pál Szabó 6 credits, theory, optional, no repetition
KÉM/302	Theory of measurement techniques of NMR spectroscopy János Rohonczy 6 credits, theory, optional, no repetition

KÉM/303	NMR spectroscopy of solids and solutions János Rohonczy 6 credits, theory, optional, no repetition
KÉM/304	Protein crystallography Veronika Harmat 6 credits, theory, optional, no repetition
KÉM/305	Organosilicon chemistry Roland Szalay 6 credits, theory, optional, no repetition
KÉM/306	Theoretical organic chemistry. II Antal Csámpai and Szilárd Varga 6 credits, theory, optional, no repetition
KÉM/308	Chemistry of protein biosynthesis Zoltán Gáspári 6 credits, theory, optional, no repetition
KÉM/309	Thermal decomposition of organic macromolecules Marianne Blazsó 6 credits, theory, optional, no repetition
KÉM/311	Theoretical background of experimental electrochemistry. II Győző Láng 6 credits, theory, optional, no repetition
KÉM/312	The Monte Carlo method Pál Jedlovszky 6 credits, theory, optional, no repetition
KÉM/313	Molecular recognition Péter Kele 6 credits, theory, optional, no repetition
KÉM/314	Carbohydrate chemistry Virág Zsoldosné Mády 6 credits, theory, optional, no repetition
KÉM/316	Nanoparticles and nanosystems Attila Bóta 6 credits, theory, optional, no repetition
KÉM/317	Biomolecular mass spectrometry Gitta Schlosser 6 credits, theory, optional, no repetition
KÉM/318	Optimization of drug substances György Tibor Balogh 6 credits, theory, optional, no repetition
KÉM/320	Analysis of protein drugs Zoltán Urbányi 6 credits, theory, optional, no repetition
KÉM/321	Electrochemical metal deposition László Péter 6 credits, theory, optional, no repetition
KÉM/324	Hyphenated techniques for elemental speciation Viktor Mihucz 6 credits, theory, optional, no repetition

KÉM/325	Theoretical methods to precision spectroscopy Edit Mátyus 6 credits, theory, optional, no repetition
KÉM/326	Selected topics from modern quantum mechanics for chemists Edit Mátyus 6 credits, theory, optional, no repetition
KÉM/327	Chemometrics Károly Héberger 6 credits, theory, optional, no repetition
KÉM/328	Modern methods of multivariate data analysis Károly Héberger 6 credits, theory, optional, no repetition
KÉM/329	Nonlinear dynamics: Self organization in chemical and biological systems István Szalai 6 credits, theory, optional, no repetition
KÉM/330	Scientific presentation Zsuzsanna Eke 6 credits, theory, optional, no repetition
KÉM/331	Digital simulation in electrochemistry Soma Vesztergom 6 credits, theory, optional, no repetition
KÉM/332	Marketing authorisation of pharmaceutical products Bulcsú Herényi & Herta Goóts Pálfi 6 credits, theory, optional, no repetition
KÉM/333	Proposal writing Ágnes Gulyás 6 credits, theory, optional, no repetition
KÉM/CD1	Credit transfer 6 credits, theory, optional, can be repeated
KÉM/TS1	Training School 3 credits, theory, optional, can be repeated
KÉM/TS2	Training School 6 credits, theory, optional, can be repeated
KÉM/LEC1	Lecture series in English 6 credits, theory, optional, can not be repeated
KÉM/LEC2	Lecture Series in English 6 credits, theory, optional, can not be repeated
KÉM/LEC3	Lecture Series in English 6 credits, theory, optional, can not be repeated
KÉM/LEC4	Lecture Series in English 6 credits, theory, optional, can not be repeated
KÉM/LEC5	Lecture Series in English 6 credits, theory, optional, can not be repeated
KÉM/LEC6	Lecture Series in English 6 credits, theory, optional, can not be repeated

EVALUATION AND CONTROL

Fulfilment of the requirements of a given course is evaluated and recorded in the transcript by the lecturer on a five-point scale (1-2-3-4-5, 1: failed 5: excellent).

Research activities are evaluated and recorded in the transcript by the supervisor on a three-point scale (excellent – acceptable – failed). Credits are approved by the program directors. Outstanding research achievements, proved by scientific publications, books or books chapters, can be honored by a maximum of 30 ECTS credits. A request for such credits should be submitted by the doctoral candidate and approved by the KDIT. Research achievements obtained prior to the start of the PhD School cannot be counted toward the degree. Exceptions can be granted by the KDIT.