(A) GENERAL DATA

<table>
<thead>
<tr>
<th>Title</th>
<th>Doctoral School of Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree</td>
<td>PhD in Chemistry</td>
</tr>
<tr>
<td>Type</td>
<td>Full degree program</td>
</tr>
<tr>
<td>Level</td>
<td>Doctoral level</td>
</tr>
<tr>
<td>Faculty</td>
<td>Faculty of Science</td>
</tr>
<tr>
<td>Institute</td>
<td>Institute of Chemistry</td>
</tr>
<tr>
<td>Department(s)</td>
<td>Doctoral School of Chemistry</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Duration</td>
<td>4 + 4 semesters</td>
</tr>
<tr>
<td>ECTS credits</td>
<td>240</td>
</tr>
<tr>
<td>Place</td>
<td>ELTE Lágymányos Campus</td>
</tr>
<tr>
<td>Minimum number of new students</td>
<td>2</td>
</tr>
<tr>
<td>Maximum number of new students</td>
<td>20</td>
</tr>
</tbody>
</table>
(B) PROGRAM CONTENT

Short description:
The Doctoral School of Chemistry of Eötvös Loránd University was founded in 1993. The topics covered by the PhD program include practically the whole spectrum of chemistry, i.e., inorganic chemistry, physical chemistry, analytical chemistry, environmental chemistry, theoretical chemistry, organic and biochemistry, electrochemistry, structural chemistry, and polymer chemistry. The program is research oriented, the students start to work on their chosen topic in the respective laboratory under the guidance of a project leader. The students must take selected courses and complete 8 exams. By the end of the 8-semester long program most of the PhD students obtain results which are published (or accepted for publication) at internationally renowned journals. At least two such papers are necessary to obtain the degree. The students report about their research progress during their study at yearly conferences organized by the School.

Strength of the program:
The Institute of Chemistry has 25 full professors and many further teacher-researchers working in various fields of chemistry. The Advisory Board of the Doctoral School of Chemistry consists of internationally renowned experts of their fields. The research advisors of the Doctoral School of Chemistry of Eötvös Loránd University collaborate with several research institutes and universities both in and outside of Hungary, and regularly have visitors from abroad doing research or giving courses.
STRUCTURE

The lecture courses can be chosen from the following topics, depending on the research interest of the student:

KÉM/201 Computational statistical mechanics
KÉM/206 Ring transformations in heterocyclic chemistry
KÉM/207 Quantum chemistry and structural determinations, advanced
KÉM/208 Quantum mechanics of molecular motions II.
KÉM/209 Stability of Colloidal Drug Delivery Systems
KÉM/210 Interfacial behaviour of macromolecules
KÉM/211 Electromigration methods
KÉM/212 Quantum chemical molecular modeling
KÉM/213 Liquid Crystals
KÉM/214 Computational Chemistry
KÉM/215 Electrostatic interactions in colloid systems
KÉM/216 Self-association of surfactants in solution
KÉM/218 Heteroaromatic Chemistry
KÉM/221 Green Chemistry
KÉM/222 The chemistry of cyclodextrins
KÉM/223 Bioconjugates
KÉM/224 Selected chapters of peptide and protein chemistry
KÉM/225 History of Electrochemistry
KÉM/226 Theoretical electrochemistry
KÉM/227 Basics of macromolecular technology
KÉM/228 Principles of molecular engineering of macromolecules
KÉM/229 Advanced organic chemistry
KÉM/230 Chromatographic separation of enantiomers
KÉM/231 New trends in X-ray crystallography
KÉM/232 Basic Neurochemistry
KÉM/233 Methods of applied statistics
KÉM/234 Modern reaction Kinetics
KÉM/235 Surface chemistry of biomaterials
KÉM/236 Solid/liquid interfacial phenomena – nanolayers
KÉM/239 Organometallic compounds in the organic synthesis
KÉM/240 Modern synthetic methods
KÉM/241 Theoretical background of experimental electrochemistry
KÉM/242  Theory of the kinetics of elementary reactions
KÉM/243  Selected topics in quantumchemistry
KÉM/244  Advanced bioorganic chemistry
KÉM/246  Shape, similarity and complementarity of molecules
KÉM/247  Preparation of cyclo- and oligopeptides
KÉM/248  Colloid Chemistry of network structures
KÉM/249  Molecular modelling
KÉM/250  Oscillation and other dynamic phenomena in chemistry
KÉM/251  Structure elucidation of peptides and proteins by NMR
KÉM/252  Bio-NMR pulse-sequences
KÉM/253  GC and HPLC in the analysis of organic compounds
KÉM/254  Methods of Quantum Chemistry
KÉM/255  Modern Methods of Quantum Chemistry
KÉM/256  Disorder in condensed phases
KÉM/257  Organofluorine Chemistry
KÉM/258  Methods of surface examination
KÉM/259  NMR spectroscopy of solids and solutions
KÉM/260  Phisycal organic chemistry
KÉM/261  Instrumental Nuclear Methods Applied in Environmental Analysis
KÉM/265  Theoretical study of protein structures
KÉM/266  Applied NMR spectroscopy
KÉM/267  Basics of NMR spectroscopy
KÉM/268  Mathematical methods in quantum chemistry I.
KÉM/269  Mathematical methods in quantum chemistry II.
KÉM/270  Peptidomimetics
KÉM/272  Modern methods of quantum chemistry
KÉM/273  Spectroscopic application of molecular dynamics
KÉM/274  Application of photoionization spectroscopy
KÉM/275  Organometallic chemistry II.
KÉM/277  Investigation of metal corrosion by electrochemical methods
KÉM/278  Asymmetric Synthesis
KÉM/279  Applied gas chromatography
KÉM/280  Sepaartion techniques in organic chemistry
KÉM/281  Environmental and health effects of energy production
KÉM/282  Combustion chemistry and physics
KÉM/283  Investigation of reaction mechanisms
KÉM/284  Applied computer simulations
KÉM/285  Elementary reaction dynamics
KÉM/286  Mass spectrometry II.
KÉM/287  Nuclear Techniques in Material Science
KÉM/288  Analytical application of plasma spectroscopy
KÉM/289  Environmental analysis
KÉM/290  Enrichment methods in atom spectroscopy
KÉM/291  Density functional methods for the description of electronic structures
KÉM/292  Vacuum Technique
KÉM/293  Basic and applied quantum chemistry
KÉM/294  Proteome Analysis and Protein Structure
KÉM/295  Applied electrochemistry
KÉM/296  Photophysics and photochemical kinetics
KÉM/298  Cyclodextrins in nanotechnology
KÉM/299  Computer-aided drug design
KÉM/301  Mass spectrometry of biomolecules
KÉM/302  Theory of NMR techniques
KÉM/303  NMR spectroscopy of solids and solutions
KÉM/304  Protein Crystallography
KÉM/305  Organosilicon chemistry
KÉM/306  Theoretical organic chemistry II
KÉM/307  Advances in organic and biomolecular chemistry
KÉM/308  Chemistry of Protein Biosynthesis
KÉM/309  Thermal decomposition of organic macromolecules
KÉM/311  Theoretical background of experimental electrochemistry II
KÉM/312  Monte Carlo method
KÉM/113  Molecular recognition
KÉM/314  Carbohydrate chemistry
KÉM/316  Nanoparticles and nanosystems
KÉM/317  Biomolecular mass spectrometry
KÉM/318  Optimization of drug substances
KÉM/320  Analysis of protein drugs
KÉM/321  Electrochemical metal deposition
KÉM/324  Hyphenated techniques for elemental speciation
(D) CAREER

Career opportunities:
Many of the former students of our Doctoral School obtained postdoctoral positions throughout the world ranging all the way from the US to Japan, often at leading universities of the world (just to name a few, Cambridge, UK; University of Tokyo; ETH Zürich). A large portion of the graduates gets tenure or tenure track positions at universities and research institutions inside and outside of Hungary. Some of our students have been pursuing their research career in a non-academic environment of large international research institutions and firms, including major pharma companies.

Job examples:
university professor, research associate, research scientist, entrepreneur, synthetic organic chemist, analytical chemist, computational chemist, program developer
TUITION AND OTHER FEES

<table>
<thead>
<tr>
<th></th>
<th>EU/EEA students</th>
<th>non-EU/EEA students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition fee/semester</td>
<td>1910 (EUR)*</td>
<td>2500 – 4500 (EUR) depending on the research topic</td>
</tr>
<tr>
<td>Application fee</td>
<td>160 (EUR)</td>
<td>160 (EUR)</td>
</tr>
<tr>
<td>Registration fee</td>
<td>60 (EUR)</td>
<td>60 (EUR)</td>
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</tbody>
</table>

* Reduced fee: 350 EUR, if you research not in the University territory.

Offered for the academic year 2017/2018? YES
Deadline for applications – September intake 01 May 2017
Is there a February intake? NO

Admission requirements – Language requirements:
A master’s degree in chemistry (or in a related field) is a requirement. A reasonable command of English language is also needed.

Criteria for ranking at the admission audition shall include:
1. previous university achievement (examinations, comprehensive examinations, qualification of degree),
2. achievements related to previous research work (awards obtained in students’ academic circles, publications in the particular professional area),
3. the feasibility of the research program.

Admission requirements – Documents to submit with application:

✓ Master-level degree
✓ Transcript of records
✓ CV
✓ Motivation letter
✓ Essay
✓ Research plan
✓ Letter of recommendation
✓ Application form
✓ Copy of the main pages of the passport (needs to be valid)
✓ Passport photo
Application procedure:

The application can be done by sending a letter with a short CV, copy of the degree certificate, transcript of results, and a language examination certificate. Details can be found at [http://www.doktori.hu/index.php?menuid=191&did=57&lang=EN](http://www.doktori.hu/index.php?menuid=191&did=57&lang=EN).

Procedure of the entrance examination:

Applicants should agree on their exact research topic with the relevant supervisor, and should make a research plan approved by her/him. Concerning the details and other documents to be submitted, please contact the international coordinator of the faculty well before the application deadline. For the thesis topics visit the following website:


The application package is reviewed by an admission committee. Then the applicant is expected to take an oral entrance examination. If a personal meeting is impossible, the interview is held through Skype or telephone. The decision on admission or rejection is made at the earliest date possible.

Selected research topics offered (please, check the current list at [http://ttk.elte.hu/node/815](http://ttk.elte.hu/node/815))

<table>
<thead>
<tr>
<th>Name</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surján, Péter</td>
<td>Many-electron theory and its application to molecular systems</td>
</tr>
<tr>
<td>Surján, Péter</td>
<td>Research in material science: theory of conjugated pi-electron systems</td>
</tr>
<tr>
<td>Salma, Imre</td>
<td>Interaction of aerosol particles with water vapour in urban environments</td>
</tr>
<tr>
<td>Salma, Imre</td>
<td>Formation, properties and environmental effects of carbonaceous aerosol</td>
</tr>
<tr>
<td>Császár, Attila</td>
<td>The fourth age of quantum chemistry: Molecules in motion</td>
</tr>
<tr>
<td>Császár, Attila</td>
<td>Small molecules as complex systems</td>
</tr>
<tr>
<td>Császár, Attila</td>
<td>Exotic chemical phenomena: Tunneling and resonances</td>
</tr>
<tr>
<td>Rábai, József</td>
<td>Synthesis of Organofluorine Compounds and Study of Their Molecular and Macroscopic Properties</td>
</tr>
<tr>
<td>Kiss, Éva</td>
<td>Surface biocompatibility of polymeric biomaterials</td>
</tr>
<tr>
<td>Kiss, Éva</td>
<td>Preparation of membrane model systems and their interaction with bioactive molecules</td>
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<tr>
<td>Kiss, Éva</td>
<td>Development of complex nanostructured drug delivery systems</td>
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<tr>
<td>Mészáros, Róbert</td>
<td>Association between oppositely charged macromolecules and surfactants</td>
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<tr>
<td>Inzelt, György</td>
<td>Preparation and characterization of conducting polymers and composites</td>
</tr>
<tr>
<td>Inzelt, György</td>
<td>Electrochemical nanogravimetric studies of microparticles</td>
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<tr>
<td>Szalay, Péter</td>
<td>Spectroscopy of the building blocks of DNA</td>
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<tr>
<td>Szalay, Péter</td>
<td>Adiabatic and non-adiabatic interactions in ozone molecule: electronic structure</td>
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<tr>
<td>Name</td>
<td>Project</td>
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<tr>
<td>-----------------------------</td>
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<tr>
<td>Szalay, Péter</td>
<td>Calculations serving spectroscopy</td>
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<tr>
<td>Baranyai, András</td>
<td>Molecular dynamics studies of water, ice and aqueous solutions</td>
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<tr>
<td>Keszei, Ernő</td>
<td>Study of ultrafast laser kinetic mechanisms</td>
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<tr>
<td>Szabados, Ágnes</td>
<td>Approximate many-body methods for describing electron correlation in molecules</td>
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<tr>
<td>Sinkó, Katalin</td>
<td>Synthesis and structure investigation of macro-, meso- and microporous materials</td>
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<tr>
<td>Turányi, Tamás</td>
<td>Development of detailed chemical kinetic mechanisms for combustion processes</td>
</tr>
<tr>
<td>Szalai, István</td>
<td>Pattern formation in reaction-diffusion systems</td>
</tr>
<tr>
<td>Orbán, Miklós – Kurin, Krisztina</td>
<td>Design, produce and study the mechanism of the chemical oscillatory processes</td>
</tr>
<tr>
<td>Orbán, Miklós – Kurin, Krisztina</td>
<td>Application of pH-oscillators to induce periodic changes in chemical, physical or biochemical equilibria</td>
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<tr>
<td>Túri, László</td>
<td>Quantum molecular dynamics simulations: theory and applications for condensed phase problems</td>
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<tr>
<td>Láng, Győző</td>
<td>Investigation of electroactive intermediates in electrochemical processes by dual voltammetry</td>
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<tr>
<td>Láng, Győző</td>
<td>Investigation of the electrochemical stability of conducting polymer films and thin metal layers</td>
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<tr>
<td>Novák, Zoltán</td>
<td>Examination of transition metal catalyzed oxidative coupling reactions</td>
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<tr>
<td>Novák, Zoltán</td>
<td>Examination of transition metal catalyzed cross-coupling reactions</td>
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<tr>
<td>Mező, Gábor</td>
<td>Development of biocjugates for selective drug targeting</td>
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<tr>
<td>Farkas, Viktor</td>
<td>Synthesis and conformational studies of peptides, peptidomimetics and proteins</td>
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<tr>
<td>Visy, Júlia</td>
<td>Investigation of ligand binding properties of biological macromolecules using spectroscopic and separation techniques</td>
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<tr>
<td>Túrós, György</td>
<td>Continuous flow synthesis of novel heterocycles with druglike properties</td>
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<tr>
<td>Hajós, György</td>
<td>Nucleophilic carbenes with fused pyridine skeleton</td>
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<tr>
<td>Bencs, László</td>
<td>Synthesis and characterization of polycrystalline scintillator materials</td>
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<tr>
<td>Pápai, Imre</td>
<td>Chemistry of Frustrated Lewis Pairs</td>
</tr>
<tr>
<td>Pápai, Imre</td>
<td>Design of Organocatalysts</td>
</tr>
</tbody>
</table>
(F) CONTACT

Program leader

Name: Prof. Attila G. Császár PhD.

Program coordinator

Name: István Szalai PhD.

International program coordinator

Name: Ms. Angelika Újváry

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