Chemistry - MSc

University of Debrecen

Egyetem tér 1., H-4032 Debrecen, Hungary

Faculty of Science, Institute of Chemistry

Kémia mesterfokozat (Vegyész MSc/MSc in Chemistry)

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Number of ECTS credits: 120

Number of credits in chemistry, physics, biology or mathematics: 114

Start of the programme: 2008-2009 academic year

Entry qualifications: Bachelor degree in chemistry or chemical engineering

I. Judging the Quality of Euromaster Programmes: "Fitness for Purpose"

Statement

The aim of this study programme is the advanced training of chemists possessing theoretical and practical knowledge in chemistry as well as satisfactory basic knowledge in related fields of science (e. g. mathematics, physics, informatics, biology and environmental protection) and at least one foreign language. The degree holders will have the ability and practical skills
- to solve chemical problems arising either in industrial or laboratory applications;
- to join actively to the research and development projects in different fields of chemistry;
- to undertake further studies in high level chemistry and chemical research with a sufficient degree of autonomy.

The Master of Chemistry will
- have the basic knowledge in all major fields of chemistry including inorganic, organic, physical, biological, analytical, structural, theoretical and technical chemistry;
- have built up high level practical skills in chemistry during laboratory courses with a special emphasis on synthetic and structural chemistry and for the application of the most common analytical techniques;
- have a basic knowledge in the use of chemical literature;
- have attained a standard level of knowledge and competence to work successfully in both chemical industry and chemical laboratories including research and development;
- have the appropriate skill and capacity to continue their studies in doctoral Schools of Chemistry at any Universities in the world.

The profile of the study programme

The Master of Chemistry degree can be obtained with three different specialization in chemistry:
- specialization in synthetic chemistry:
  30 credits (minimum) are used to develop specialized knowledge in the field of organic and inorganic synthesis, spectroscopic methods and separation techniques focusing on their application in pharmaceutical and polymer chemistry;
- specialization in analytical chemistry:
  30 credits (minimum) are used to develop specialized knowledge in the field of modern analytical chemistry including the major electrochemical, spectroscopic and separation techniques and the principles of production process control and quality insurance;
- without pre-determined specialization (specialization is planned and selected by the applicants)
  35 credits (maximum) can be used for advanced studies in the most common fields of chemistry.

II. Study Programme

TABLE 1

		1. semester			
Code (Neptun)	**Module/course unit title**	**Total teaching hours (lecture / seminar / practice)**	**Credit**	**Compulsory / Optional**	**Requirement**
TKME0203EN	Bioinorganic Chemistry	2/0/0	3.00	Compulsory	examination
TKME0401EN	Theoretical Physical Chemistry I.	2/0/0	3.00	Compulsory	examination
TKME0301EN	Synthetic Methods in Organic Chemistry I.	2/0/0	3.00	Compulsory	examination
TKML0405EN	Advanced Physical Chemisry Laboratory I.	0/0/4	3.00	Compulsory	grade
TKME0205EN	Organometallic Chemistry	2/0/0	3.00	Compulsory	examination
TKME0303EN	Bioregulation	2/0/0	3.00	Compulsory	examination
TFME0992EN	Metals and Ceramics	2/0/0	3.00	Optional	examination
TKME0529EN	Capillary Electrophoresis	2/0/0	3.00	Compulsory (analytical spec.)	examination
TKML0202EN	Inorganic Methods in Environmental Analysis	0/0/4	3.00	Compulsory (analytical spec.)	grade
TKME0235EN	Inorganic Methods in Environmental Analysis	1/0/0	1.00	Compulsory (analytical spec.)	examination
			28.00		

		2. semester			
Code (Neptun)	**Module/course unit title**	**Total teaching hours (lecture / seminar / practice)**	**Credit**	**Compulsory / Optional**	**Requirement**
TKML0201EN	Inorganic Chemistry	0/0/4	3.00	Compulsory	grade
TKME0402EN	Theoretical Physical Chemistry II.	2/0/0	3.00	Compulsory	examination
TKML0406EN	Advanced Physical Chemisry Laboratory II.	0/0/2	2.00	Compulsory	grade
TKML0302EN	Syntetic Methods in Organic Chemistry II.	0/1/3	3.00	Compulsory	grade
TKME0327EN	Heterocycles	2/0/0	3.00	Compulsory	examination
TKME0501EN	Instrumental Analysis	2/0/0	3.00	Compulsory	examination
TKME0502EN	Methods of Structure Determinations	2/0/0	3.00	Compulsory	examination
TKME0601EN	Introduction to Chemical Engineering	2/0/0	3.00	Compulsory	examination
			23.00		

		3. semester			
Tárgykód	**Tárgynév**		**Tárgy kredit**	**Tárgyfelvétel típusa**	**Tárgykövetelmény**
TKME0501EN	Instrumental Analysis Laboratory	0/0/3	2.00	Compulsory	examination
TKML0502EN	Methods of Structure Determinations Laboratory	0/0/3	2.00	Compulsory	grade
TKME0602EN	Chemical Technology	2/0/0	3.00	Compulsory	examination
TKML0001_EN	Diploma thesis I.		15.00	Compulsory	grade
			22.00		
		4. semester			
TKML0002_EN	Diploma thesis II.		15.00	Compulsory	grade
			15.00		

		Analytical specialization				
semester	**Code (Neptun)**	**Module/course unit title**	**Total teaching hours (lecture / seminar / practice)**	**Credit**	**Compulsory / Optional**	**Requirement**
2	TKME0511EN	Chemometrics I.	2/0/0	3.00	Compulsory	examination
4	TKME0513EN	Quality Assurance in Analytical Chemistry	1/0/0	1.00	Compulsory	examination
4	TKME0317EN	Modern mass spectrometry	2/1/1	4.00	Compulsory	examination
2	TKME0315EN	Modern Gas and Liquid Chromatography I.	2/0/0	3.00	Compulsory	examination
3	TKML0315EN	Modern Gas and Liquid Chromatography II.	0/0/4	3.00	Compulsory	grade
3	TKML0202EN	Inorganic Methods in Environmental Analysis	0/0/4	3.00	Compulsory	grade
3	TKME0235EN	Inorganic Methods in Environmental Analysis	1/0/0	1.00	Compulsory	examination
4	TKME0529EN	Capillary Electrophoresis	2/0/0	3.00	Compulsory	examination
				21.00		
	Analytical spezialization- Optional courses, 9 credits					
1	TKME0521EN	Food Analysis	2/0/0	3.00	Optional	examination
2	TKME0514EN	Sampling, sample treatment, analytical tests	1/0/0	0.00	Optional	
2	TKML0514EN	Sampling, Sample Treatment, Analytical Test	0/0/4	4.00	Optional	grade
4	TFME0990EN	Nanotechnology	2/0/0	3.00	Optional	examination
4	TKME0523EN	Radioanalytical Chemistry	2/0/0	3.00	Optional	examination
2	TKME0310EN	The Basics of Liquid Chromatography - Pharmaceutical Applications	2/0/0	3.00	Optional	examination
2	TKML0310EN	Liquid Laboratory Practice	0/0/4	3.00	Optional	grade
3	TKML0530EN	NMR Operator Training	0/0/2	2.00	Optional	grade
2	TKME0215EN	Complex Equilibria laboratory	0/0/4	3.00	Optional	grade

		Synthetic specialization				
semester	Code (Neptun)	Module/course unit title	Total teaching hours (lecture / seminar / practice)	Credit	Compulsory / Optional	Requirement
2	TKME0311EN	Reactions Mechanism	2/0/0	3.00	Compulsory	examination
3	TKME0312EN	Asymmetric Synthesis	2/0/0	3.00	Compulsory	examination
3	TKME0313EN	Modern Synthetic Methods in Polymer Chemistry	2/0/0	3.00	Compulsory	examination
2	TKME0314EN	Introduction to Pharmacology	2/0/0	3.00	Compulsory	examination
2	TKME0315EN	Modern Gas and Liquid Chromatography I.	2/0/0	3.00	Compulsory	examination
3	TKML0315EN	Modern Gas and Liquid Chromatography II.	0/0/4	3.00	Compulsory	grade
4	TKME0317EN	Modern mass spectrometry	2/1/1	4.00	Compulsory	examination
4	TKMG0319EN	High Efficient Synthetical Technics	0/1/0	0.00	Compulsory	
4	TKML0319EN	High Efficient Synthetical Technics	0/0/3	3.00	Compulsory	grade
3	TKML0530EN	NMR Operator Training	0/0/2	2.00	Compulsory	grade
				27.00		
	Synthetic specialization- Optional courses, 3 credit					
4	TKME0321EN	Glycobiochemistry	2/0/0	3.00	Szabadon választható	examination
4	TKME0322EN	Molecular Engineering	2/0/0	3.00	Szabadon választható	examination
4	TKME0323EN	Carbohydrate Chemistry	2/0/0	3.00	Szabadon választható	examination
4	TKME0324EN	Agrochemicals	2/0/0	3.00	Szabadon választható	examination

c) Year 1 & 2 (elective):

Module/course unit title	**Credits (ECTS)**	**Compulsory (C) Semi-optional (S) or Elective (E)**	**Total Teaching Hours**				**Pre-requisites**
			Lecture	Practical		Other	
NMR Operator Training	2	E		2			BSc courses
Molecular Engineering	3	E	2				BSc courses
Mathematical Methods in Chemistry	2	E				2	BSc courses
Computational Quantum Chemistry	2	E				3	BSc courses
Computational Image Processing	3	E	2				BSc courses
Surface Physics	3	E	2				BSc courses
Metals and Ceramics	3	E	2				BSc courses
Applied Coordination Chemistry	3	E	2				BSc courses
Complexes of Macrocyclic Ligands	3	E	2				BSc courses
Special and Dangerous Materials	3	E	2				BSc courses
Biocolloid Chemistry	3	E	2				BSc courses
Dynamic NMR Spectroscopy	3	E	2				BSc courses
Theoretical Physical Chemistry Problems	2	E				2	BSc courses
Complex Catalysis in Organic Syntheses	3	E	2				BSc courses
Environmental Chemistry	3	E	2				Theoretical Physical Chem. (co-requisite)
Modern Infrared Spectroscopy	3	E	2				BSc courses
X-Ray Diffraction	3	E	2				BSc courses
Secondary Natural Compounds I.	3	E	2				BSc courses
Secondary Natural Compounds II.	3	E		4			Secondary Natural Compounds I:
Enzyme Technology	3	E	2				BSc courses
Biochemistry II.	3	E	2				BSc courses
Biochemistry III.	3	E		3		1	BSc courses
Professional Communication in English	3	E				4	state-recognized language exam

III. Language

The prerequisite for the entry of Master programme is the Chemistry Bachelor Degree which includes the knowledge of one foreign language (one of the most common living languages used in sciences, preferably English, French, German, Italian, Spanish or Russian). At Master level, where the ability for research is one of the main components of the programme the language proficiency covers the communication competences in English because the vast majority of the chemical literature is now written and available in this language.

3.1 Language of instruction:

The basic language for teaching of Master students is Hungarian, but many of the various multimedia teaching techniques will be used in English.

3.2 Textbooks:

At the Master level the chemical literature is only partly available in Hungarian language and the English textbooks comprise a standard part of the literature for further readings.

3.3 Student presentations:

Students are encouraged to perform their presentation in English especially during the preparation of their Master Thesis.

3.4. Optional language courses:

Competences in reading and understanding English will be helped by special language courses in chemistry covering 8 credits. The participation of Master students in various Mobility Programmes will also be encouraged to promote the communication abilities.

IV. ECTS and Student Workload

The academic year is divided into two semesters both of which consist of a 14-week study period and a 6-week examination period (40 weeks/year). The number of contact lessons is 25-30 hours/week during the study period. Student workload estimation: 1.5 credits for 1 hour lecture (weekly in a single semester), 1 credit for 1 hour seminar, 0.75 credits for 1 hour laboratory practical. The Faculty of Science has standardized questionnaires for student course assessment which should be completed at the end of each semester in relation to every course. Course assessment or other student feedback is collected strictly anonymously on these forms. At the end of each semester the Educational Committee of the Institute of Chemistry evaluates the experience of the teaching staff and those of the students obtained by the above method. Corrections if necessary can be made accordingly taking into account the expected knowledge/skill levels.

V. Modules/Course Units and Mobility

Student mobility is possible in each semester, but it is mainly encouraged in the third and fourth semesters. Both incoming and outgoing mobilities are opened. Acceptance of courses taken at other institutions is approved by the Educational Committee of the Institute of Chemistry on a case-by-case basis, and the opinion of the instructor of the course is an important factor in the decision. There are no specific courses that can be taken exclusively at the University of Debrecen.

VI. Methods of Teaching and Learning

Lectures are usually given to the undivided class of Chemistry MSc students (about 20 to 40 students in the first year). These courses are only occasionally organized together with students of other specialization. The lecture halls are equipped with permanent overhead and computer projectors and the transparencies/slides are generally available for students via internet in the homepage of the Institute of Chemistry. The use of multimedia teaching techniques is highly encouraged. In the absence of a dedicated course textbook, students are always given access to the lecture materials (overheads or computer files) through the Internet and as hardcopy in a copy shop located in the chemistry building.

Practical courses are taught in dedicated student laboratories in groups of no more than 20 students. Mostly, two instructors are assigned to every laboratory group, at least one of whom is always a senior faculty member, the other is a less experienced faculty member, or senior PhD student. Number of problem solving classes is rather low at the Chemistry MSc level and they are taught in small groups of maximum 15-20 students. Each group is assigned one instructor, who can be a faculty member or a senior PhD student. There is usually no formal organization of teamwork in theoretical courses. Students are expected to work individually in about 50 to 70 % of the laboratory courses. In the rest of the courses, students do the practical work in groups of 2-4, although report preparation and assessment remain mainly individual. The Master Thesis must be written from the individual research of each student supervised by one of the senior faculty members. The subject of the Master Thesis is selected in the second semester from a list provided by the Educational Committee of the Institute of Chemistry and the selection is finalized by the approval of the Board of the Chemistry Institute. In the case of specialization the

supervisors can be selected from other Universities or industrial research laboratories which are related to the subject of specialization (instrumental analytical chemistry or synthetic organic or inorganic chemistry).

All faculty members have two dedicated hours each week, in which they should be available in their offices for student questions.

The Board of the Chemistry Institute includes one undergraduate and one graduate student member, who do not have voting rights. There are 8 student members on the Board of the Faculty of Science, who have full voting rights. Besides the general student organizations, chemistry students have a self-organized advisory association, which is also helped by some faculty members.

VII. Assessment Procedures and Performance Criteria

Examinations closing theoretical courses are primarily the responsibility of the lecturers or team of lecturers teaching the course. Exams are usually taken at the end of the semester in the examination period, although mid-term written tests are included in some of the theoretical courses. In some of the courses, high-performing students can receive an excellent grade based on the mid-term test without an oral exam.

Written and oral exams are both common, but taking into account the relatively low number of MSc students and the advanced level of education the oral exams are preferred (about 30 and 70 % for the written and oral exams, respectively). The written tests are not generally approved by examination boards although some exams are compiled, corrected and marked by teams of faculty members rather than individuals. Corrected written tests are always available for students for checking, who can discuss the answers and marking with the instructor, and this should lead to correction of occasional errors.

Oral examinations are usually taken in the presence of a single examiner, who is the instructor of the course. However, more than one student is always present in the room when an oral exam is taken. In both oral and written exams, students can ask to be examined by a board after two failed exams. A board is at least two senior faculty members and includes the responsible instructor of the course.

VIII. ECTS Grades (Ranking)

The grading system corresponds to a 1-5 graded scale:
ECTS A ≈ **5** – excellent performance, knowledge of >90 % of the teaching material
ECTS B ≈ **4** – good performance, knowledge of more than ~70-75 % of the teaching material
ECTS C ≈ **3** – average performance, knowledge of more than ~50-60 % of the teaching material
ECTS D, E ≈ **2** – satisfactory performance, knowledge of at least 40-50 % of the teaching material
ECTS FX, F ≈ **1** – fail, knowledge of less than 40-50 % of the teaching material

IX. The Diploma Supplement

Each graduate is issued an official Diploma in Hungarian and a European Diploma Supplement in English. A sample diploma supplement is displayed in the appendix. Translations of Diplomas or Transcripts of Study Records are also available upon request from the offices of the faculty of Natural Sciences.

X. Quality Assurance

External quality assurance is provided by the Hungarian Accreditation Committee and is based on self evaluation reports and visits on site in every 8 years. These include investigation of the degree programmes, personal and objective conditions of research and education, and end up in a comprehensive evaluation report with recommendations for the future period. It is then the responsibility of the Faculty Council to implement these recommendations and carry out other improvements.

Internal quality assurance is based on relevant programs of the university as well as that of the Faculty of Science. The Faculty has a process description for various aspects of the training inclusive educational, organizational, and control issues, student feedback possibilities. This description lays down responsibilities in the above points for each member of the academic and administrative staff as well as duties in informing students about curriculum and requirements, and also organization and evaluation of student feedback. Also encouraged by the Hungarian Ministry of Education and Culture a feedback system for degree holders is being developed to collect information about employability, usability of the contents of curricula. In this context continuous discussions with companies of the region also contribute to the improvement of training. At the level of the Institute of Chemistry the Educational Committee (consisting of delegates of the departments as well as the responsibles for each study programme) headed by the deputy director has the responsibility to survey and control the above process. At the Faculty level the Committee for Educational Affairs and Quality Assurance (consisting of the institutes' responsibles and those of the study programmes) headed by a vice dean deals with the above issues.

XI. Employability

The linear higher education system started in 2006 in Hungary, therefore no direct experience is available for the employability of recipients of MSc degree in chemistry. The former educational system, however, comprised ten semesters (5 years at University) which corresponds to the present BSc + MSc level. In the last few years, a very wide selection of different jobs was offered for these students both in the academic and industrial institutions. The extensive discussions with companies of the Eastern and Northern Hungary regions, where a significant part of the Hungarian chemical and pharmaceutical industry is located, have indicated that chemistry Masters will also find jobs in the chemical production, as well as in industrial quality assurance, analytical and synthetic laboratories. Also public authorities in the field of plant and environmental protection, agrochemical and food quality assurance, medical and health sectors will employ these people.

A brief statement on resources available for the programme: laboratories, libraries, ICT, other resources.

Buildings and laboratories:
The Institute of Chemistry is located in the Campus of the University of Debrecen and consists of two buildings (a six-floor and a seven-floor building). It was built in 1969 and was planned for the training of 200 students in each semester. The building consists of at least seven laboratories which are used exclusively for teaching purposes. There are another 20-30 laboratories for the most common instruments of analytical and structural chemistry and used both by research and teaching purposes. The remaining part of the building is used for research and development projects.

Structure of the Institute of Chemistry:
The Institute of Chemistry is built up from five Departments:
- Department of Inorganic and Analytical Chemistry
- Department of Physical Chemistry
- Department of Colloid and Environmental Chemistry
- Department of Organic Chemistry
- Department of Applied Chemistry

A new Department has been established in 2007 and located in the pharmaceutical factory „TEVA" close to the University. It provides the appropriate base for the cooperation between industrial, research and educational Institutions.
Teaching of biochemistry is performed by the Departments of Biochemistry belonging to the Institute of Biology and the Medical School.

Libraries:
The University has a big library in the central building. It is the second biggest library in Hungary and works also as a National Library. The „Chemistry Library" originally worked in the Chemistry Building, but in 2005 it moved to the new „Life Science Building", and a new library for all chemical, biological and medical sciences was established.

Facilities and Instrumentation:
All Departments are equipped with the most common instruments (pH meters, spectrophotometers, etc.), while separate laboratories were established for the purposes of analytical, synthetic and structural chemistry. These laboratories include:
NMR laboratory: equipped with 200, 360, 400 and 500 MHz NMR instruments
Mass Spectrometry: BIFLEX III MALDI-TOF and MicroTof-Qmass spectrometer with ESI, APCI and APPI ion-sources.
Analytical laboratory: atomic spectroscopy: AAS (3) and ICP instruments, ionchromatographs, HPLC and GC laboratories
Laboratory of fast reaction kinetics: sequential stopped flow instruments, rapid quench flow instruments
Optical Spectroscopy: Polarimeters and spectropolarimeters (CD + ORD) equipped with HPLC and/or MS, Static and Dynamic Laser Light Scattering Instruments.
X-ray laboratory for the Enraf-Nonius 3 X-ray diffractometer.
Pilot plant

Statement of Applicant

*I, **Professor Dr. László Fésüs, Rector of the University of Debrecen** hereby agree that this institution will, if awarded the Euromaster label, recognise Master degrees in chemistry awarded by other institutions holding the Euromaster label as providing automatic right of access (but not of admission) to chemistry PhD programmes offered by this institution.*

Debrecen, 31st January, 2008.

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Prof. Dr. László Fésüs
rector of the University of Debrecen
member of the Hungarian Academy of Sciences

Appendix

Part 1

Course descriptions

Course title:	**Physical Methods in Materials Science**
Course code:	**TFME....**
Type of course:	**lecture**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Daróczi, Lajos**
Prerequisites:	**BSc Physical Chem., BSc Structural Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To review the physical and chemical methods used in materials science and introduce students to several specific methods of physics and engineering science.

Course contents
Mechanical measurement methods: tensile testing, bend testing, hardness testing, break testing, wear and abrasion testing, methods of crack testing: magnetic, X-ray, and ultrasonic crack testing. Microscopies: optical microscopy, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, field ion microscopy and field emission microscopy. testing methods for magnetic materials: methods for measuring magnetization, magnetometers, domain structure testing. Bitter method of magnetic imaging, Kerr microscopy, Barkhausen noise analysis. methods for studying chemical composition: optical and X-ray spectroscopy, mass spectroscopy, SIMS, SNMS, EELS, ESCA and other electron spectroscopies. Diffraction methods: X-ray, electron, and neutron diffraction.

Recommended reading
1. Harangozó István-Patkó József: Kísérleti atom-és molekulafizika, egyetemi jegyzet KLTE Szft. 1986
2. Pozsgai Imre: Pásztázó elektronmikroszkópia és elektronsugaras mikroanalízis alapjai, egyetemi jegyzet 1994
3. Radnóczi György: A transzmissziós elektronmikroszkópia és elektrondiffrakció alapjai, egyetemi jegyzet KLTE Szft. 1994
4. D.B. Williams, C. B. Carter: Transmission electron microscopy I-IV. Plenum Press New York 1996
5. C. Giocavazzo et al.: Fundamentals if Crystallography, Oxford University Press 1992.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Theoretical Atom and Molecule Physics**
Course code:	**TFME....**
Type of course:	**lecture**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Vibók, Ágnes**
Prerequisites:	**BSc Physical Chem., BSc Structural Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles and methods of quantum mechanical description of atoms and molecules in order to aid the interpretation of chemical changes and the acquisition of specific quantum chemical methods.

Course contents
Quantum theory of the structure of atoms and molecules. Free atoms and molecules. The Schrödinger equation. Born-Oppenheimer and adiabatic approximations. Hellmann-Feynman theorem. Virial theorem. Variational principle, variational methods. perturbation methods. Wave functions. Matrices between determinant wave functions. Multielectron wave functions. ratree-Fock method. Approximation methods for calculating electron correlation. Electronic states of atoms. LS and jj coupling. Atoms in electric and magnetic field. Selection rules. Classification of electronic states of molecules. Molecules in electric and magnetic field. Molecular spectra.

Recommended reading
1. Antal János: Fizikai kézikönyv műszakiaknak, Műszaki Könyvkiadó, Budapest, 1980.
2. Kapuy Ede és Török Ferenc: Az atomok és molekulák kvantumelmélete, Akadémiai Kiadó, Budapest, 1975.
3. L. A. Gribov, M. ,A. Jeljasevics, B. I. Sztyepanov és M.V. Volkenstein: Molekularezgések, Akadémiai Kiadó, Budapest 1979.
4. D. R. Yarkony: Modern Electronic Structure Theory, World Scientific, 1995.
5. I. Mayer: Simple Theorems, Proofs, and Derivations in Quantum Chemistry, Kluwer Academic, 2003.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Bioinorganic Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Sóvágó, Imre; Várnagy, Katalin**
Prerequisites:	**BSc Inorganic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce the basic concepts of bioinorganic chemistry with emphasis on the differentiation between essential, beneficial and toxic elements, and the recognition of their roles/hazards in biochemical processes and in the human environment.

Course contents
Elementary composition and classification of the elements in biological systems. Essential, beneficial and toxic elements and their role in biochemical processes. Coordination chemistry of the most common bioligands including amino acids, peptides, proteins, carbohydrates, nucleotides and porphyrins. Characterization of metalloproteins and metalloenzymes. Involvement of alkaline and alkaline earth metal ions biological processes: cation distribution and membrane transport processes. Binding, transport and activation of oxygen. The participation of iron and copper in biological oxidation reactions. The structure and properties of iron and copper proteins. Biochemistry of zinc: zinc containing enzymes and zinc finger proteins. Involvement of other essential elements in biological processes: the enzymes/coenzymes of manganese, cobalt, nickel, molybdenum, vanadium and selenium. The use of inorganic compounds in therapy and diagnosis. Environmental aspects of inorganic substances.

Recommended reading
1. S.J. Lippard, J.M. Berg, Principles of Bioinorganic Chemistry, University Science Books, Mill Valley, CA 1994.
2. Gergely Pál: Általános és bioszervetlen kémia, Semmelweis Kiadó, Budapest, 2001.
3. E.I. Ochiai, General Principles of Biochemistry of the Elements, Plenum Press, New York, London (1987).
4. W. Kaim, B. Schwederski, Bioinorganic Chemistry, Inorganic Elements in the Chemistry of Life, John Wiley and Sons, Chichester, 1994.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral examination with the involvement of two examiners.

Course title:	**Coordination Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Tóth, Imre; Farkas, Etelka**
Prerequisites:	**BSc Physical Chem., BSc. Inorganic Chem., BSc Spectroscopy**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students into the modern theory of coordination compounds and the experimental methods used to study them.

Course contents
Basic concepts and nomenclature of coordination chemistry. Isomers in coordination compounds. Crystal field and ligand field theories. Optical and magnetic properties of complexes. Structural studies of complexes by UV-vis, ESR, NMR, IR, Raman and Mössbauer spectroscopies. Diffraction methods in solution. Thermodynamics of complex equilibria, macroscopic and microscopic processes. The stability of complexes. Kinetics and mechanism: solvent exchange, complex formation, and redox reactions.

Recommended reading
1. M. T. Beck, I. Nagypál: Chemistry of Complex Equilibria, Akadémiai Kiadó, Budapest, 1990
2. J. Burgess: Ions in Solution: Basic Principles of Chemical Interactions, Ellis Horwood Series in Inorganic Chemistry, 1988;
3. S. F. A. Kettle: Physical Inorganic Chemistry: A Coordination Chemistry Approach, Spektrum Academic Publishers, 1996;
4. E. A. V. Ebsworth, D. W. H. Rankin, S. Cradock: Structural Methods in Inorganic Chemistry, 2nd ed., Blackwell Scientific Publications, 1991.
5. N. N. Greenwood, A. Earnshow: *Az elemek kémiája* (Nemzeti Tankönyvkiadó, 2. kiadás, Budapest, 2004**)**

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Organometallic Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Buglyó, Péter**
Prerequisites:	**BSc Inorganic Chem., BSc Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to modern organometallic chemistry.

Course contents
Definition and general characterization of organometallic compounds. Detailed overview of the organometallic compounds of Li, Mg, B, Al, Si, and Hg. Types and important general properties of Na, Be, Tl, Sn, Pb, Zn, and Cd-organic compounds. Carbonyl, alkyl, alkene and cyclopentadyenil complexes. Importance of organometallic compounds in catalysis.

Recommended reading
1. Emri József: Elemorganikus vegyületek kémiája, Kossuth Egyetemi Kiadó, Debrecen, 2004
2. Faigl Ferenc, Kollár László, Kotschy András, Szepes László: Szerves fémvegyületek kémiája, Nemzeti Tankönyvkiadó, Budapest, 2001
3. N. N. Greenwood, A. Earnshaw: Az elemek kémiája I-III. NTK, 2004.
4. N. N. Greenwood, A. Earnshaw: Chemistry of the Elements, Butterworth-Heinemann, Pergamon Press, 1997.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Inorganic Chemistry Laboratory II.**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Buglyó, Péter; Lázár, István; Tóth, Imre**
Prerequisites:	**BSc Inorganic Chem., BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to the modern practice of inorganic synthesis.

Course contents
Preparation of several different compounds of various metals and nonmetals at unusually low or high temperature, at unusually high or low pressure, in dry or oxygen-free solvents, or under strictly anaerobic conditions. Characterization of the prepared compounds by various instrumental methods.

Recommended reading
1. N. N. Greenwood, A. Earnshaw, Az elemek kémiája I-III, Tankönyvkiadó, 2004.
2. Lengyel B., Csákvári B., Általános és szervetlen kémiai praktikum II. Tannkönyvkiadó.
3. J. D. Woollins, Inorganic Experiments, VCH, 2003.

Teaching methods
Teaching in small groups: practical courses, problem-solving classes, teamwork as an element of teaching.

Assessment methods
Short test (15-20 min) each week before the laboratory work based on preparatory material of that week and the results of the experiments carried out the previous week.

Course title:	**Theoretical Physical Chemistry I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Póta, György**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present some advanced fields of physical chemistry with novel methods or approaches.

Course contents
Basics of irreversible thermodynamics: forces and currents, Onsager equations, entropy production, cross relations, physical and chemical applications, possibilities of structure formation.
Reaction kinetics: reactor dynamics, stationary state and stability. Moving reaction fronts in gases and solutions, simultaneous transport processes and chemical reactions. Chaotic kinetic phenomena.
Electrochemistry: electrochemical kinetics, current and potential. Electrochemical equilibrium. Description of electrochemical system through electric circuits. Batteries and environmental protection.
Surface phenomena: mechanics and thermodynamics, adsorption. Modern surface investigation methods. Heterogeneous catalysis. Concepts and applications of nanotechnology.

Recommended reading
1. P. W. Atkins: Fizikai kémia III, NTK, Bp. 2002
2. Bazsa György (szerk.): Nemlineáris dinamika és egzotikus kinetikai jelenségek kémiai rendszerekben, egyetemi jegyzet, Debrecen ; Budapest ; Gödöllő, 1992
3. Inzelt György: Az elektrokémia korszerű elmélete és módszerei I-II. NTK Bp. 1999.
4. Rohrsetzer Sándor (szerk.) Kolloidika, Tankönyvkiadó Budapest, 1991.
5. Nagy Lajos György, Nagyné László Krisztina: Radiokémia és izotóptechnika, Műegyetemi kiadó, 1977.
6. P. W. Atkins, J. de Paula: Physical Chemistry, 7th ed.; Oxford University Press: Oxford, 2002.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Theoretical Physical Chemistry II.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Póta, György**
Prerequisites:	**Theoretical Physical Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present some advanced fields of physical chemistry with novel methods or approaches.

Course contents
Biophysical chemistry: thermodynamics of living systems, transport processes, and physical chemical description of some regulation phenomena. macromolecules and their biological roles. Application of quantum chemistry: and overviews of important methods in quantum chemistry (HF electron correlation, semiempirical nd DFT methods). Determination of structural parameters of molecules (molecular geometry, energy, normal vibration modes, parameters connected to electron density). Methods for studying the thermodynamics and mechanisms of chemical reactions. Potential energy hypersurface.
Isotpy: thermodynamics of isotope effects. Qualitative interpretation of the interaction between nuclear radiation and matter. Overview of theoretically possible nuclear reaction and their realization. Environmental problems in nuclear energy production: chemical forms of radioactive isotopes in nature.

Recommended reading
1. P. W. Atkins: Fizikai kémia III, NTK, Bp. 2002
2. Bazsa György (szerk.): Nemlineáris dinamika és egzotikus kinetikai jelenségek kémiai rendszerekben, egyetemi jegyzet, Debrecen ; Budapest ; Gödöllő, 1992
3. Inzelt György: Az elektrokémia korszerű elmélete és módszerei I-II. NTK Bp. 1999.
4. Rohrsetzer Sándor (szerk.) Kolloidika, Tankönyvkiadó Budapest, 1991.
5. Nagy LajosGyörgy, Nagyné László Krisztina: Radiokémia és izotóptechnika, Műegyetemi kiadó, 1977.
6. P. W. Atkins, J. de Paula: Physical Chemistry, 7th ed.; Oxford University Press: Oxford, 2002.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Advanced Physical Chemistry Laboratory**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**1**
Number of credits:	**5**
Name of lecturer:	**Kathó, Ágnes; Bányai, István; Nagy, Noémi**
Prerequisites:	**Theoretical Physical Chem. (co-requisite)**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide a clear understanding of principles and techniques of experimental methods used in physical chemistry. To teach how to use laboratory apparatus, how to carry out complex experiments and how to interpret experimental results

Course contents
Most of the experiments (measurement of thermodynamic parameters, study of solution and phase equilibria, electrochemical and kinetic investigations) are the same as in B.Sc. physical chemistry labs. However, the experiments are more complex and students are also required to show more independence in experiment planning and computational data evaluation.
Homogeneous isotope exchange in ethyl iodide-$^{131}I^-$, electrochemical separation of ^{212}Pb and ^{212}Bi. Size determination in solution, study of surface activity and other surface phenomena.

Recommended reading
1. Fizikai kémiai laboratóriumi gyakorlatok (szerk.: Kathó Á.), Tankönyvkiadó, Budapest, 1988.
2. Bevezetés a fizikai kémiai mérésekbe (szerk. : Kaposi O.), Tankönyvkiadó, Budapest, 1988.
3. P. W. Atkins, J. de Paula: Physical Chemistry, 7th ed.; Oxford University Press: Oxford, 2002.

Teaching methods
Practical course, where the required theoretical information, the required calculus skills and a brief introduction to the measurement method is obtained from several sources prior to the laboratory class: previous courses and recommended readings. During the class, the measurements are carried out mainly independently with the help of the teaching staff (if required), the report is also prepared as an independent work.

Assessment methods
Individual work in experiments and evaluation of data, complete and detailed laboratory report, short written test (15-20 min) to check the knowledge of theoretical background of the actual experiment. The questions are from a list which is given to the students at the beginning of the semester together with the list of recommended readings. The measurements and knowledge of the associated theory are graded and an overall grade (calculated as 33% of the test and 66% of the report grades) is given. The tests and the reports are corrected and signed by the teaching staff and can be always discussed with the corrector.

Course title:	**Synthetic Methods in Organic Chemistry I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**1**
Number of credits:	**3**
Name of lecturer:	**Patonay, Tamás**
Prerequisites:	**BSc Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to the basics of modern synthesis design in organic chemistry and general synthetic methodologies.

Course contents
Concept and types of synthones. Application of synthones in the synthesis of chains and carbocycles. Concept of retrosynthesis, retrosynthetic analysis of organic molecules. Important protecting groups, basic techniques of protection and deprotection. Methods for preparing complex organic molecules. Representative applications for naturally occurring molecules.

Recommended reading
1. S. Warren, Organic synthesis: The disconnection approach, Wiley Chichester, 1982.
2. J. Fuhrhop, G. Penzlin, Organic synthesis, VCH, Weinheim, 1986.
3. T.W. Greene, P.G.M. Wuts, Protective groups in organic synthesis, Wiley, New York, 1986.
4. P.C. Kocienski, Protecting groups, Thieme, Stuttgart, 2004.

Teaching methods
Multimedia teaching techniques based on Powerpoint presentations are used. Problem solving parts are also included to extend the knowledge of the students at certain areas, particularly in the field of synthon approach.

Assessment methods
Anonymous written examination (1 ½ - 2 hours) at the end of the semester. Questions to be answered include both concepts and problem solving. The corrected and marked tests can be viewed by the students on request. In the case of an unacceptable result of the written examination, the first repeated exam could be take orally. Second repeated exams will be done in the presence of a three-membered committee.

Course title:	**Synthetic Methods in Organic Chemistry II.**
Course code:	**TKML....**
Type of course:	**laboratory practice and seminar**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**4**
Name of lecturer:	**Juhász, László; Juhász-Tóth, Éva**
Prerequisites:	**Synthetic Methods in Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To use the methods presented in 'Synthetic Methods in Organic Chemistry I.' in the organic chemistry laboratory practice.

Course contents
Reactions using septum technique and protecting gases. Application of metal hydrides, transfer hydrogenation. Reactions with organometallic compounds. Transition metal catalyzed coupling reactions. Cycloadditions and 1,3-dipolar cycloadditions. Asymmetric reduction and forming C-C bonds. Enzyme catalyzed synthetic processes, hydrolytic kinetic resolution. Multistep synthesis on natural compounds using protecting groups.

Recommended reading
1. R.O.C. Norman, J.M. Coxon, Principles of Organic Synthesis, Blackie Academic, 1993.
2. Guo-Qiang Lin, Yue-Ming Li, A.S.C. Chan, Princilples and Applications of Asymmetric Synthesis, John Wiley, 2001.
3. D. Mayo, R. Pike, P. Trump, Microsclae organic laboratory with multistep and multiscale synthesis, 4th edition John Wiley, 2000.
4. M. Schlosser, Organometallics in Synthesis, John Wiuley, 2004.
5. U.T. Bornscheuer, R.J. Kazlauskas, Hydrolases in organic synthesis, WILEY-WCH, Weinheim, 1999.

Teaching methods
Teaching in small groups: practical courses, problem-solving classes, teamwork as an element of teaching.

Assessment methods
Short test (15-20 min) each week before the laboratory work based on preparatory material of that week and the results of the experiments carried out the previous week.

Course title:	**Bioregulation**
Course code:	**TBME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Kerékgyártó, János; Barna, Terézia**
Prerequisites:	**BSc Biochem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present biochemical processes connected to regulation.

Course contents
Bioregulation on a molecular level. Interaction between protein conformation and regulation. Regulation on the enzymatic level: allosteric regulation, post-synthetic modifications. Neural and hormonal regulation. Mechanism of hormone action. Regulation of gene expression, operon regulation, splicing and RNA.

Recommended reading
1. Ádám Veronika: Orvosi Biokémia, Medicina, 2002.
2. J. M. Berg, J. M. Tymoczko, L. Stryer: Biochemistry, 5th Edition, W.H. Freeman and Co., 2002.
3. J. Darnell, H. Ladish, D. Baltimore: Molecular cell biology, Scientific American Books, 1986.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Assessment is carried out with written examination at the end of semester (duration is 1 hour). If the written examination is failed, an oral examination is available.

Course title:	**Instrumental Analysis**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Gáspár, Attila**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To widen the students theoretical knowledge of instrumental analysis.

Course contents
Methods of sampling and sample preparation. Atom emission spectroscopic methods: atom structure and structure of emission spectra (atomic and ionic). Modern excitation methods in atom spectroscopy: direct current and high frequency (ICP) plasma, laser excitation. Modern optical and light dispersion methods: fiber optics, holographic gratings. Detector systems and signal analysis: photomultiplier tubes, background correction, computer control. Atomic absorption methods: principles and practice of AAS methods, radiation sources, atomization methods. Systems for background correction and signal analysis. Instruments and inorganic chemistry applications of mass spectrometry: magnetic (Nier), double focusing (Herczog) quadrupol and time-of-flight spectrometers. Ion sources: electron impact, chemical, ICP. Molecule absorption spectrophotometry and its applications in inorganic chemistry: single-beam and double beam UV-vi spectrophotometers. Spectrophotometric methods of chemical analysis: differential spectrophotometry, derivative spectrophotometry. Electrochemical analysis: conductometry, oscillometry. Theoretical background of ion selective electrodes, potentiometry. Modern methods of polarography. Automated analyses: Flow Injection Analysis. Separation techniques: modern planar chromatography, quantitative layer chromatography, capillary gel chromatography, high performance liquid chromatography, hyphenated techniques. Capillary electrophoresis.

Recommended reading
1. R. Kellner: Analytical Chemistry, 1998, Wiley-VCH (ISBN 3527288813)
2. Pungor Ernő: Analitikai kémia, Tankönyvkiadó (BME egyetemi jegyzet), Budapest, 1985.

Teaching methods
Making efforts to maintain the interests of the students during the whole lecture using multimedia like animations, video to teach techniques. The slides of the whole lecture (in ppt) are available in the web. The last part (few minutes) of each lecture is devoted to discussions with the students.

Assessment methods
The assessments are carried out with oral examinations at the end of the semester. The examiner is the the lecturer.

Course title:	**Methods of Structure Determination**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Szilágyi, László**
Prerequisites:	**BSc Spectroscopic Methods**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the theoretical and measurement-related principles of modern spectroscopic methods in sufficient detail to solve typical problems occurring in practical structural determination.

Course contents
Nuclear spin relaxation: spin-lattice and spin-spin relaxation times. Bloch equations. Solutions of Bloch equations: shape of resonance band, saturation. Principles of pulsed NMR spectroscopy. Measurement of T_1 and T_2. Principles of dynamic NMR, two- and multisite exchange, NMR time scale. Equivalence and internal rotation. Applications of dynamic NMR. Applications of NMR double resonance methods. The g factor in ESR. Correlations between the g factor and molecular structure. Principles of nuclear quadrupol resonance (NQR). Quadrupol interactions in NM spectra and principles of the FT NMR method.
Interpretation of effects in electron spectra based on molecular structure. Relationship between optical parameters (rotation, circular dichroism) of molecules and their stereochemistry. Interdependences between UV, CD, and OR data. Infrared (IR) spectroscopy): theory of vibrational spectra. Factors influencing characteristic group and bond frequencies. Stereochemical information in vibrational spectra.
Ionization methods in mass spectrometry. Fragmentation processes and their interpretation. Stability of ions. Problem solving based on spectroscopic methods with simultaneous sue of different methods. Rules of fragmentation and their interpretation. Analysis of mass spectra. Gas chromatography, coupled gas-chromatography and mass spectrometry, and applications.

Recommended reading
1. Szilágyi László: Mágneses rezonancia, Kossuth Egyetemi Kiadó, Debrecen, 2001.
2. P.J.Hore: Mágneses magrezonancia, Nemzeti Tankönyvkiadó RT, Budapest, 2003.
3. Dinya Z.: Elektronspektroszkópia, Tankönyvkiadó, Budapest, 1979.
4. Dinya Z.: Infravörös spektroszkópia, Tankönyvkiadó, Budapest, 1981.
5. Dinya Z.: Szerves tömegspektrometria, Debreceni Egyetemi Kiadó, Debrecen, 2002.
6. A. E. Derome**:** Modern NMR Techniques for Chemistry Research (Pergamon Press) 1993

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of the semester.

Course title:	**Inorganic Methods in Environmental Analysis**
Course code:	**TKME....**
Type of course:	**lecture and laboratory practice**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**2**
Number of credits:	**4**
Name of lecturer:	**Braun, Mihály**
Prerequisites:	**BSc Inorganic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles of inorganic environmental analysis and provide students with hands-on experience in sampling, sample treatment, instrument operation and maintenance.

Course contents
Lecture: Sampling, sample treatment and analysis of environmental samples. General phases of environmental analysis presented through specific examples. Methods used in inorganic environmental analysis. Standards tests for determining inorganic components in surface waters, soil, and air. Methods used in on-site measurements. Specific information for the methods used in the lab practices.
Lab practice: Testing of surface water, soil, and air samples. Validation of methods, presentation and analysis of results. Students perform the test in groups of 4 or 5. The samples analyzed by students are also analyzed by professional stuff and the students results are assessed in comparison with those data. At the end of the lab, a discussion of common errors is carried out.

Recommended reading
1. Papp L.: Környezeti minták analitikai kémiai vizsgálata, Debreceni Egyetemi Kiadó
2. Papp S., Kümmel, R.: Környezeti kémia, Tankönyvkiadó, Budapest, 1992
3. Pokol Gy., Sztatisz J.: Analitikai Kémia I., Műegyetemi Kiadó, Budapest, 2003
4. R. Kellner: Analytical Chemistry, 1998, Wiley-VCH (ISBN 3527288813)

Teaching methods
In each laboratory practices the teacher explaines the theoretical background of the method and the practical arrangements of the instrumentation. The parts of the instrumentation will be shown in detailed. The students themselves will measure on the given instrument with the assistance of the teacher. The last part (few minutes) of the practice is devoted to discussions with the students.

Assessment methods
The students will be assessed in each laboratory practice both in written (short test about the theoretical aspects of the method) and in oral (few minutes discussion between the students and the teacher at the end of the practice. The students should record each step of the measurements in their laboratory notebook. The evaluation of the obtained results and the laboratory notebook will be checked by the teacher.

Course title:	**Organic Methods in Environmental Analysis**
Course code:	**TKME....**
Type of course:	**lecture and laboratory practice**
Level of course:	**semi-optional**
Year of study:	**1**
Semester:	**2**
Number of credits:	**4**
Name of lecturer:	**Lázár, István**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the theoretical principles, detection limits, Hungarian, European and American official standards of the instrumentation used for analyzing hazardous organic pollutants and provide hand-on experience in the application of these methods.

Course contents
Lecture: Hazardous pollutants, their concentration ranges in the environment and types of hazards. Sample treatment before trace pollutant analysis, traditional and pre-concentration methods. Sample handling and storing, requirements for equipment in contact with the sample. Further workup of concentrated samples, clean-up procedures. Safety during analysis.
Analytical chromatographic methods with emphasis on LC and GC. General description of instruments, detector selection. Environmental application of GC-MS, GC-MS^n, LC-ESI-MS, and LC-MS-TOF. Coupled chromatographic techniques with extremely low detection limits.
Hungarian, European, and American standards for the analysis of environmental pollutants. Searching for environmental and analytical information on the World Wide Web.
Laboratory: Sample preparation for trace analysss, concentration methods. Surface pre-treatment of equipment. Extraction, follow-up treatment of concentrated samples and clean-up. Full sample analysis with GC-FID, HPLC-UV/VIS, and other methods. Preparation of environmental samples for MS analysis, data evaluation. Identification of unknown pollutants.

Recommended reading
1. Dinya Zoltán-Suszter Gabriella-Kiss Attila-Papp Gábor-Bak István: Környezetszennyező szerves vegyületek analitikája (egyetemi jegyzet, Kossuth Egyetemi Kiadó, 2002)
2. Environmental Analysis, R. N. Reeve. John Wiley and Sons Ltd. 1994.
3. Dr. Kőmíves József, Környezeti Analitika, Műegyetemi kiadó 1997-98

Teaching methods
Tutorial system: oral lecture with one lecturer. Multimedia teaching techniques applied: overhead projector, computer demonstration, projector. Problem-solving classes: the laboratory practice is a fully problem-solving class combined with experiments and consultation.

Assessment methods
Written examinations at the end of the semester. Students are provided with the correct answers on request. The examination is the individual responsibility of the examiner and marks are not checked by additional faculty members.

Course title:	**Methods of Structure Determination Laboratory**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**semi-optional**
Year of study:	**2**
Semester:	**3**
Number of credits:	**2**
Name of lecturer:	**Szilágyi, László**
Prerequisites:	**Methods of Structue Determination**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide practical experience in the application of modern spectroscopic methods for chemical structure determination.

Course contents
Calculations: Zeeman interaction, Boltzmann distribution, chemical shielding, chemical shift scales. 1H NMR examples of weakly coupled spin systems. Simple spectrum reconstruction. Moderately complex 1H NMR spectra. Overlapping, incomplete spectral information. Examples of 13C NMR spectra. Additivity and shift rules. Simultaneous use of 1H and 13C NMR to determine structure and configuration. Principles of pulsed FT-NMR.
Detection, analysis and problem solving of UV-vis, CD, and IR spectra. Complete structural determination uding combined NMR, UV-vis, IR, MS, and CD data. MS: electron impact and chemical ionization. GC-MS measurements. Determination of compounds with unknown structure by MS. Mass spectroscopic characteristics of different types of compounds.

Recommended reading
1. Szilágyi László: “ ^{1}H NMR spektrumok", Tankönyvkiadó, Budapest, 1979.
2. R.M. Silverstein, F.X. Webster: „Spectrometric Identification of Organic Compounds”,. Wiley 1998.
3. Dinya Z.: Elektronspektroszkópia, Tankönyvkiadó, Budapest, 1979.
4. Dinya Z.: Infravörös spektroszkópia, Tankönyvkiadó, Budapest, 1981.
5. Dinya Z.: Szerves tömegspektrometria, Debreceni Egyetemi Kiadó, Debrecen, 2002.

Teaching methods
In each laboratory practice, the teacher explaines the theoretical background of the method and the practical arrangements of the instrumentation. The parts of the instrumentation will be shown in detail. The students themselves will measure on the given instrument with the assistance of the teacher. The last part (few minutes) of the practice is devoted to discussions with the students.

Assessment methods
The students will be assessed in each laboratory practice both in written (short test about the theoretical aspects of the method) and in oral (few minutes discussion between the students and the teacher at the end of the practice. The students should record each step of the measurements in their laboratory notebook.

Course title:	**Instrumental Analysis Laboratory**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**semi-optional**
Year of study:	**2**
Semester:	**3**
Number of credits:	**2**
Name of lecturer:	**Gáspár, Attila**
Prerequisites:	**Instrumental Analysis**
Language of instruction:	**Hungarian or English**

Objective of the course
To widen the students' practical knowledge about modern analytical instrumentation.

Course contents
Overpressure layer chromatography. Capillary electrophoresis. Preparation and application of ion selective electrodes. Flow Injection Analysis. Methods for speciation analysis. On-line sample introduction methods. Hydride techniques an atomic absorption analysis. Analytical applications of ICP-OES. Validation of analytical methods.

Recommended reading
1. Pungor Ernő: Analitikai kémia, Tankönyvkiadó (BME egyetemi jegyzet), Budapest, 1985.
2. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle: Instrumental Methods of Analysis, Wadsworth Publ. Co., Belmont, California, 1988.
3. R.D. Braun: Introduction to Instrumental Analysis, McGraw-Hill Book Co., New York, 1987.
4. Pokol György - Sztatisz Janisz: Analitikai kémia I., Műszaki Egyetem Kiadó, Budapest, 1999.
5. Burger Kálmán: Az analitikai kémia alapjai, Semmelweis Kiadó, Gyula, 1999.

Teaching methods
The course includes numerous different analytical methods. In each laboratory practices the teacher explaines the theoretical background of the method and the practical arrangements of the instrumentation. The parts of the instrumentation will be shown in detailed. The students themselves will measure on the given instrument with the assistance of the teacher.
The last part (few minutes) of the practice is devoted to discussions with the students.

Assessment methods
The students will be assessed in each laboratory practice both in written (short test about the theoretical aspects of the method) and in oral (few minutes discussion between the students and the teacher at the end of the practice. The students should record each step of the measurements in their laboratory notebook. The evaluation of the obtained results and the laboratory notebook will be checked by the teacher.

Course title:	**Introduction to Chemical Engineering**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Kéki, Sándor**
Prerequisites:	**BSc Chemical Technology**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the basic principles and calculation methods of chemical engineering science.

Course contents
Similitude. Physical quantities, units, dimensions. Scalars, vectors, tensors. Covariance. Similitude criteria and similitude invariables. Extensive and intensive properties. Balance equations. Currents. Uniqueness criteria. Theory of transport processes, generic transport equation – basic classification of engineering processes. Dimensional analysis: concepts and methods. Dimension matrices. Dimensionless numbers. Classes of dimensionless numbers and connections between them. Dimensional analysis and similitude. Aero- and hydrodynamics: fundamental equations, the Navier-Stokes equations, Bernoulli equation. Equation of momentum transport. Momentum balance. Similarity transformation. Free flow. Effect of changes in uniqueness criteria. Momentum transport in turbulent flow. Simultaneous flow of liquid and solid particles. Balance equations. Similarity transformation. Thermal conductivity and diffusion. Continuity equation fro mass transport. Mass transport in a flowing liquid. Heat exchange in a flowing liquid. Thermal diffusion. Chemical reactions: stoichiometric equations, mass balance, energy balance, momentum balance. Principles of reactor technology. Thermal analysis of chemical reactors. Equilibria: phase equilibrium, equilibrium lines, working lines.

Recommended reading
1. Ullmann's Encyclopedia of Industrial Chemistry, 5th ed., Weinheim, Germany, VCH, 1990-5.
2. J.M. Coulson, J.F. Richardson, R.K. Sinnot: Chemical Engineering, Pergamon, Oxford, 1983
3. A. L. Lydersen: Fluid Flow and Heat Transfer, John Willey & Sons, (1982)
4. Szűcs Ervin: Hasonlóság és modell, Műszaki Könyvkiadó, Budapest, 1972.
5. Benedek P., László A.: A vegyészmérnöki tudomány alapjai, Műszaki Könyvkiadó, Budapest, 1964.
6. K.G. Denbigh, J.C.R. Turner: Kémiai reaktorok, Műszaki Könyvkiadó, Budapest, 1971.

Teaching methods
Learning and teaching are enhanced by multimedia presentations including visualization of chemical processes and calculations. Problem-solving exercices are also implemented.

Assessment methods
Written examinations at the end of semester. The marking of the written examination is checked by a second qualified examiner. The maximum time allowed for written examinations is 2 hours.

Course title:	**Chemical Technology**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Zsuga, Miklós**
Prerequisites:	**BSc Chemical Technology**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the most important processes in industrial organic chemistry.

Course contents
Chlorination, nitration, sulfonation and oxidation of paraffin hydrocarbons. Chlorination, hydration, and oxidation of olefins. Syntheses with CO-H_2 mixtures. Oxo synthesis. Nitration of aromatic compounds. Preparation of amines from aromatic nitro compounds. Sulfonation, chlorination, and oxidation of aromatic compounds. Friedel-Crafts reactions. Acylation, esterification. Photochemical processes in the chemical industry. Reductions. Reactor materials in industrial organic chemistry. Environmental aspects in industrial organic chemitry.

Recommended reading
1. Ullmann's Encyclopedia of Industrial Chemistry, 5th ed., Weinheim, Federal Republic of Germany, VCH, Volumes: A1-A28, 1985-1996.
2. Deák Gyula: Szerves vegyipari alapfolyamatok kézikönyve, Műszaki Könyvkiadó, Budapest, 1978.
3. K. Wiessermel, H.J. Arpe, Ipari Szerves Kémia, NTK, 1993.

Teaching methods
Learning and teaching are enhanced by multimedia presentations including visualization of chemical processes and calculations. Problem-solving exercices are also implemented.

Assessment methods
Written examinations at the end of semester. The marking of the written examination is checked by a second qualified examiner. The maximum time allowed for written examinations is 2 hours.

Course title:	**Chemometrics I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in analytical chemistry specialization**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Braun, Mihály**
Prerequisites:	**BSc Mathematics, BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present statistical and chemometric information related to planning and evaluating of experiments and hypothesis testing.

Course contents
Basic mathematical statistics and probability theory. Discrete distributions. Normal distribution as the most important continuous distribution. Approximation of distributions. Statistical conclusions. Statistical properties of samples. Distribution of the squared deviation in a normal distribution, F distribution and t (Student) distribution. Hypothesis testing, statistical tests. Type I and Type II errors. U test and χ^2 test for variances. F test: comparison of two variances. Comparison of several variances: Bartlett and Cohran tests. Student's t tests for expectations: single *t* test, double *t* test, paired *t* test. Parameter estimation. Characteristics of different estimation methods. Least squares method, maximum likelihood method, moment method. Statistical test and graphical representation of goodness of fitting. Simultaneous distribution of probability variables, correlation. Univariate linear regression. Regression analysis for samples without and with repeated measurements. Determination of the prediction interval. Intercept and slope of fitted straight lines. Comparison of two regression straight lines. Multivariate linear regression. Measurements without repetition. Significance tests for variables. Nonlinear regression. Polynomial regression. Regression for probability independent variables. Error propagation. Selection of the type of empirical regression functions. Preparation for the solution of regression problems and checking the preliminary assumptions after fitting. Residual analysis.

Recommended reading
1. Kemény S., Deák A.: Kísérletek tervezése és értékelése, Műszaki Kiadó, Budapest, 2000
2. Kemény S., Deák A: Bevezetés a Statistica 5.0 for Windows program használatába, Műegyetemi Kiadó, Budapest, 1997.
3. Horvai Gy. (szerk.) Sokváltozós adatelemzés (kemometria). Nemzeti Tankönyvkiadó, Budapest, 2001.
4. Gy. Póta: Mathematical Problems for Chemistry Students, Elsevier, 2006

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examinations at the end of semester.

Course title:	**Chemometrics II.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in analytical chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Braun, Mihály**
Prerequisites:	**Chemometrics I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present systematic methods of experiment panning and the application of multivariate analysis in chemometrics.

Course contents
Experiment planning, qualitative and quantitative variables, measurements scales. Multifactor experiments. Data transformation. Variance analysis (ANOVE): I. The model. Parameter estimation within the model. Decomposition of the sum of squared deviations. Hypothesis testing and ANOVA table. II. Confidence intervals for the expectations of groups. Homogeneity testing for variances. Type II errors. Comparisons for several levels of a single factor. General, multiple, planned and post hoc comparisons. Variance analysis for random factors. Nested design. Non-parametrical alternatives of variance analysis. Covariance analysis. Classical covariance for one auxiliary variable. Covariance analysis for orthogonal auxiliary variables.
Combination of regression and variance analysis. Hypothesis testing with general regression test. Parallelity and horizontality tests of straight lines. Hypothesis testing with orthogonal models. Multivariate statistics. Method selection. Generalization of mono- and divariate methods. Parameters of multivariate normal distributions and parameter estimation.
Principal component analysis. Values and weights of principal components, calculation of communality. Dimension reduction in multivariate space. Factor analysis. Discriminance analysis and comparison of groups. Linear discriminance analysis, cluster analysis. Measurement of similarity, distance and association. Group forming algorithms. Hierarchal and non-hierarchal cluster analysis. Dendograms and their interpretation. Methods for shape recognition.

Recommended reading
1. Kemény S., Deák A.: *Kísérletek tervezése és értékelése.* Műszaki Kiadó, Budapest, 2000
2. Horvai Gy. (szerk.): *Sokváltozós adatelemzés (kemometria)*. Nemzeti Tankönyvkiadó, Budapest, 2001.
3. Gy. Póta: Mathematical Problems for Chemistry Students, Elsevier, 2006

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of semester.

Course title:	**Quality Assurance in Analytical Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in analytical chemistry specialization**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Braun Mihály**
Prerequisites:	**B.Sc. Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present basic information about official regulations governing quality assurance.

Course contents
Meeting standard requirements - history of quality assurance. Accreditation (ISO/IEC 17025) and quality management (ISO 9000:2000). GLP: Good Laboratory Practice. Principles of Total Quality Management. handbooks of quality assurance. Statistical principles. Uncertainty in measurements. calibration, detection and determination limits. Metrology in chemistry, tracing of analytical results. Certified Reference Materials. Validation of analytical methods. Use of certifying cards in laboratories. Self-certified laboratory measurements.

Recommended reading
1. Kemény S., Papp L., Deák A. 1998. Statisztikai minőség- (megfelelőség)-szabályozás. Műszaki Könyvkiadó – Magyar Minőség Társaság, Budapest.
2. B.W. Wenclawiak (ed). 2002. Quality Assurance in Analytical Chemistry: Training and Teaching Springer Verlag
3. Palotai K., Győri P. , 1998. A TQM elmélete és gyakorlata. IMSYS Vezetési Tanácsadó Kft. Budapest

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral examination at the end of semester.

Course title:	**Sampling, Sample Treatment, Analytical Tests**
Course code:	**TKME....**
Type of course:	**lecture and laboratory practice**
Level of course:	**compulsory in analytical chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**4**
Name of lecturer:	**Posta, József; Tóth, Imre**
Prerequisites:	**Instrumental Analysis**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles and practice of pre-analysis sample treatment and rapid analytical tests.

Course contents
Sampling of gases, aerosols, and different types of dusts from air. Fractional sampling with cascade impactors. Sampling in natural waters. Average and point sampling in liqiuds. Representative sampling techniques for solids. Sampling of soil, river, lake and sea sediments. Methods for preserving the layered structure of sediments. Sampling methods for biological, human or plant analyses. Sampling for speciation analysis. Particle size dependent, fractional sampling in mists, smokes and soils. Stabilization of samples. Requirements for the transport and storage of samples. Sample preparation for classical and instrumental analysis. gas absorption and pre-concentration. Filtration of liquids. Acid dissolution, destruction, and base dissolution of samples. Heat or microwave-assisted dry ashing, wet destruction in an atmospheric or high pressure closed reactor. Advantages and drawback of particular sampling methods. Pre-concentration methods for trace elements. Separation of analytes from interfering matrices. Test methods. chemical principles of rapid tests. Tests in on-site and laboratory analytical methods. Practical use of commercial available test papers and other rapid test methods, limits of their applicability.

Recommended reading
1. Pap Lajos: Környezeti minták analitikai vizsgálata, Egyetemi jegyzet, DE Kossuth Egyetemi Kiadó, Debrecen, 2004.
2. Erdey László, Mázor László: Analitikai kézikönyv, Műszaki Kiadó, Budapest, 1974.
3. Litheráty Péter: Környezetvédelem analitikája, BME Mérnöktovábbképző Intézet kiadványa, 1975.
4. Radojevič, M., Bashkin V. N.: Practical environmental analysis, The Royal Society of Chemistry, Cambridge, 1999.

Teaching methods
Lecture: multimedia techniques. *Practice*: working in small groups, individual problem assignments.

Assessment methods
Short tests at the veginning of laboratory sessions and oral or written examinations at the end of the semester.

Course title:	**Environmental Mass Spectrometry**
Course code:	**TKME....**
Type of course:	**lecture and laboratory practice**
Level of course:	**compulsory in analytical chemistry specialization**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Lázár, István**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles and practice of mass spectrometric methods used in environmental analysis, instrument parts and evaluation of EI mass spectra.

Course contents
Lecture: Mass spectrometry used in environmental analysis (GC, LC). Ion sources: EI, CI, ESI. Quadrupol mass spectrometers: simple, 3D and linear ion tarps, triple quadrupol instruments, magnetic sector and high-resolution instruments. Detectors, data processing systems, computationally aided spectrum analysis and compound identification. Electron impact ionization: ion generating processes, importance of ionization energies. Molecule fragmentation processes, their interpretation. Loss of neutral atom groups, rearrangement reactions, ion-radical and radical-radical secondary reactions, metastable ions and their analytical applications.
Seminar: Basic MS characteristics: base peak, molecule ion, isotopic distribution patterns. Identification of molecule ions in EI spectra: problems, possible and frequently used solutions. Molar mass determination from MS. Elementary composition, systematic search for possible structures. Degree of unsaturation, number of rings. Nitrogen rule. General methods for spectrum evaluation, algorithms. Practical use of spectrum databases, search for accaptable matches. Comparison of mass spectra obtained by 3D and quadrupol mass spectrometers. Characteristics of CI mass spectra. Multidimensional mass spectrometry (MS^n). Overview of the characteristic mass spectra of hazardous and banned compounds in the environment.

Recommended reading
1. Dinya Zoltán: Szerves tömegspektrometria, Kossuth Egyetemi Kiadó, 2003
2. Dinya Zoltán-Suszter Gabriella-Kiss Attila-Papp Gábor-Bak István: Környezetszennyező szerves vegyületek analitikája (egyetemi jegyzet, Kossuth Egyetemi Kiadó, 2002)
3. R. M. Smith: Understanding Mass Spectra: A Basic Approach (2nd ed.), John Wiley and Sons, Hoboken, New Jersey, 2004

Teaching methods
Lecture: multimedia teaching techniques. Problem-solving seminars: fully devoted to problem-solving and consultation.

Assessment methods
Written examination at the end of the semester. Marks are not cross-checked, they are the responsibility of the examiner. Students are provided with the correct answers on request.

Course title:	**Food Analysis**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Várnagy, Katalin**
Prerequisites:	**Instrumental Analysis**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles, methods, governing regulations, practice and evaluation of up-to-date food analysis.

Course contents
Definition of quality. Objectives and institutions of quality assurance. Public health production, consumer needs (consumption characteristics, product safety, consumption habits). Food regulation and testing, limiting values. Hungarian Regulations for food quality. FAO-WHO Codex Alimentarius. Hungarian standards. Methods and instruments in quality assurance. US regulations and methods: AOAC and AACC. Accreditation of laboratories and production facilities.
Analysis of wheat according to Hungarian standards: purity, dry material content, siker content and quality, pharinograhic value, SDS test, fall number determination. Alveographic measurements. Test baking. Polarometric determination of starch and sugar content. SOXTEC determination of oil content. FIBERTEC determination of fiber content. Application of the NIR/NIT instrument. Kjeldahl and Dumas determination of protein content. Determination of amino acid content. Calculation of nutrition value. Determination of minerals (ICP, AAS, other methods). Application of HPLC, GMO detection. Determination of radioactive contamination. Microbiological tests.

Recommended reading
1. Kent K. Stawart-John R. Whitaker: Moderm Methods of Food Analysis. AVI Publishing Company, INC Westport, Connecticut, 1984.
2. R. Matisek-F.M. Schnepepl: Lebensmittel – Analitik. Springer Verlag, Berlin, 1992.
3. Győri Z. – Győriné Mile I.: A búza minősége és minősítése. Mezőgazdasági Szaktudás Kiadó, Budapest, 1998.
4. Lásztity R. – Törley D.: Alkalmazott élelmiszeranalitika I-II. Mezőgazdasági kiadó, 1987.
5. Karácsony L.: Gabona-, liszt-, sütő- és tésztaipari vizsgálati módszerek. Mezőgazdasági Kiadó, Budapest 1970.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Nanotechnology**
Course code:	**TFME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Beke, Dezső**
Prerequisites:	**none**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles, applications and characteristic processes of nanophysics and nanotechnology.

Course contents
Preparation and investigation of thin and multilayers. Nanoscale fabrication and modification on surfaces and methods for studying the products. Mechanical stability and life time of nanostructures. Design and production of spin manipulation based devices. Technologies for working with nanoparticle assemblies. Nanomagnetism. Nanodiffusion. Nanosegregation.

Recommended reading
1. Giber János et al.: "Szilárdtestek felületfizikája" Műszaki Könyvkiadó, Budapest, 1987.
2. A MATÁV és az MTA közös szervezésében 2004-ben tartott Nanotecnológia szimpózium anyaga
3. Specific notes published on the Web
4. Nanomágnesség. Belső jegyzet, DE Szilárdtest Fizika Tanszék, 2003.
5. Poole Ch. P., Owens F. J.: Introduction to Nanotechnology, Wiley-Interscience, 2003.
6. Wolf E. L.: Nanophysics and Nanotechnology: An Introduction to Modern Conepts in Nanoscience (2nd ed.), Wiley-VCH, 2006.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Radioanalytical Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, Noémi**
Prerequisites:	**BSc Analytical Chem., BSc Nuclear Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present analytical methods using nuclear radiations.

Course contents
Applications of nuclear radiation in chemical analysis. Non-destructive and destructive methods of analysis. Qualitative and quantitative methods of analysis. Investigation of chemical speciation and structure with radioactive methods or nuclear radiation. Practical applications in environmental science, industry, agriculture, medical science and biology.

Recommended reading
1. Tölgyessy J.: Magsugárzás a kémiai analízisben, Műszaki Könyvkiadó, Budapest, 1965.
2. D. De Soete, R. Gijbels, J. Hoste: Neutron activation analysis, Wiley-Interscience, London, 1983.
3. H. A. Das, A. Faanhof, H. A. van der Sloot: Environmental Radioanalysis, Elsevier, Amszterdam, 1983.
4. A. Vértes, S. Nagy, Z. Klencsár: Handbook of nuclear chemistry, Kluwer Academic Publishers, Boston, 2003.

Teaching methods
Oral presentation with the aid of multimedia teaching techniques.

Assessment methods
The course is ended with oral examinations. One examiner or at least another person (at least another student) takes place on the examiantions. The questions and the figures, equations, slides, etc. presented on the lectures are found on the homepage of the department.

Course title:	**Atomic Absorption Spectrometry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Posta, József**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To make students familiar with the theoretical aspects and practical applications of atomic absorption spectrometry.

Course contents
The AAS method and its place among the instrumental methods of analysis. Theoretical aspects of the connection between light absorption and atomic structure. The basis of flame chemistry. Sample transformations in a flame, the space and time course of atomization, regulation of these processes. Characterization of flames of different composition, their analytical importance. Physical and chemical sample transformations in a heated graphite tube. Sample introduction methods and interferences in atomic absorption spectrometry. The parts of AAS instruments. The role of each unit in improving signal/noise ratio. The theory and practice of background correction. Practical applications of AAS. Determination possibilities and conditions for elements, groups of elements from different types of samples. Sample demand, noise level, accuracy, reliability, limit of detection, analytical sensitivity. Practical aspects of analysis optimization. The influence of sample preparation on the determination of a given element.

Recommended reading
1. Pungor E.: A lángfotometria elméleti alapjai, Akadémiai Kiadó, Budapest, 1962
2. W.F. Price: Atomabszorpciós spektrometria, Műszaki Könyvkiadó, Budapest, 1977
3. Pokol Gy., Statisz J.: Analitikai Kémia I., Műegyetemi Kiadó, 1999
4. B. Welz, M. Sperling: Atomic Absorption Spectrometry, Wiley-VCH, New York, 1999

Teaching methods
Theoretical course, multimedia teaching techniques.

Assessment methods
Written and oral examinations at the end of the semester.

Course title:	**ICP-OES/MS**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Braun, Mihály**
Prerequisites:	**Instrumental Analysis**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles and practice of inductively coupled plasma methods (ICP-OES and ICP-MS) in chemical analysis.

Course contents
Importance of inductively coupled plasma (ICP) methods in analytical spectrometry. Atmospheric pressure plasmas: types and characteristics. Principles of atomic emission.
Instruments of inductively coupled optical emission spectrometers. Radio frequency generators, plasma types, sample introduction methods. Optical instrument parts, monochromators and polychromators, detectors. Introduction of liquid samples. Analysis of solid samples and suspensions. Direct sample introduction. Electrothermic evaporation. Optimization of ICP-OES measurements. Working parameters. Calibration, detection limits, measuring range, determination of reproducibility and stability. Interferences and techniques to diminish their effects. Applications of ICP-OES methods. Analysis of environmental samples. Geological and industrial applications. Coupled techniques. Instruments of inductively coupled plasma mass spectrometry (ICP-MS). The plasma as an ion source. Comparison of ICP-OES and ICP-MS methods: instrument design, performance. Sample introduction methods. The path of ions from the plasma to the mass spectrometer. Connection between ICP and MS: the interface. Ion focusing. Mass analyzers: magnetic sector, quadrupol and time-of-flight spectrometers. Detectors and their properties. Optimization of ICP-MS methods. Applications of ICP-MS.

Recommended reading
1. Pokol Gy., Sztatisz J. , 2003. Analitikai Kémia I. Műegyetemi Kiadó, Budapest
2. Fábián I. (szerk), Braun M., Daróciné Somogyi A., Deák Gy., Kathó Á., Kiss L., Lente G., Nagy I., Papp L., Párkányiné Berka M., Posta J. (1998): Műszeres analitikai kémiai gyakorlatok. KLTE, Debrecen.
3. Boss, Ch, B., Freeden, K.J. 1997. Concepts, instrumentation, and techniques in inductively coupled plasma optical emission spectrometry. Perkin Elmer Corporation.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Problem-Centered Modern Analytical Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Lente, Gábor**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present a problem-centered overview of various methods used in modern analytical chemistry.

Course contents
The use of analytical chemistry and its specialized instruments for specialized or non-scientific purposes: law enforcement and forensic analysis, archeometry, doping and drug testing, pharmaceutical analysis, food and drinking water analysis. Analytical instruments on board of space probes and space stations. Selection of the ideal analytical methods for specific problems. Methods for obtaining the most information from the results of instrumental measurements.

Recommended reading
1. Kellner, R.; Mermet, J.-M., Otto M., Widmer, H.M.: Analytical Chemistry, Wiley VCH, 1998.
2. Analytical Chemistry, American Chemical Society..
3. Environmental Science and Technology, American Chemical Society.

Teaching methods
Multimedia teaching techniques. Individual assigments in current analytical literature review.

Assessment methods
Written test examination at the and of the semester based on simple and multiple choice test questions.

Course title:	**Analytical Chemistry in the 21st Century**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Gáspár, Attila**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present recently developed methods of analytical chemistry and their fields of applications.

Course contents
Analytical methods under development in the first years of the 21st century:
Lab-on-a-chip technology: Analysis of picoliter and attoliter sample volumes. Bioanalyzer (Agilent): automated analytical systems for testing DNA, RNA, proteins, and cells.
Microfluidics: flow injection – capillary electrophoresis. Sample preparation, sample treatment, chromatographic and electrophoretic separation on chips, coupling of chips with mass spectrometers.
Miniaturization: Miniaturized Total Analysis Systems: μ-TAS
Single cell analysis: analysis of viruses, bacteria, possibilities for analyzing single cell volumes.
Analytical applications of nanotubes (nanotechnology). Biosensors
Application of computer simulations in analytical chemistry (PeakMaster). The latest HPLC/CE ChemStation (Agilent), and Bioanalyzer evaluation software
Affinity electrophoresis: determination of binding constants with computer simulation and experimentally for pharmaceutical compounds, study of interactions between ligands and proteins or viruses.

Recommended reading
1. Harris, D.C.: Quantitative Chemical Analysis, W.H. Freeman and Co., 2003
2. Analytical Chemistry, American Chemical Society.
3. Environmental Chemistry, American Chemical Society.

Teaching methods
Making efforts to maintain the interests of the students during the whole lecture using multimedia like animations, video to teach techniques. The slides of the whole lecture (in ppt) are available in the web. The last part (few minutes) of each lecture is devoted to discussions with the students

Assessment methods
The assessments are carried out with oral examinations at the end of the semester. The examiner is the the lecturer.

Course title:	**Capillary Electrophoresis**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Gáspár, Attila**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To overview the history and theoretical foundations of various modern capillary electrophoresis methods.

Course contents
Methods covered: capillary zone electrophoresis (CZE), micellar electrokinetic capillary electrophoresis (MEKC), capillary isoelectronic focusing (CIEF), capillary gel electrophoresis (CGE), capillary isotachophoresis (CITP). Instruments for various capillary electrophoresis methods and their parts. Principles of method development for the separation of various samples: capillary size, buffer/electrolyte selection, injection method, additives, temperature. Method optimalization. General characteristics of evaluation softwares. Validation methods. Demonstration laboratory practice at the end of the course.

Recommended reading
1. F.Foret, L.Krivankova, P.Bocek: Capillary Zone Electrophoresis, VCH Weinheim, 1993
2. http:// delfin.unideb.hu/~agaspar/ce.pdf
3. Gáspár A.: Kapilláris zónaelektroforézis, egyetemi jegyzet, Egyetemi Kiadó, Debrecen, 2000
4. D.N. Heiger, High Performance Capillary Electrophoresis, HF, Germany.

Teaching methods
Making efforts to maintain the interests of the students during the whole lecture using multimedia like animations, video to teach techniques. The slides of the whole lecture (in ppt) are available in the web. The last part (few minutes) of each lecture is devoted to discussions with the students

Assessment methods
The assessments are carried out with oral examinations at the end of the semester. The examiner is the the lecturer.

Course title:	**NMR Operator Training**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**2**
Name of lecturer:	**Kövér, Katalin**
Prerequisites:	**BSc Physical Chem., BSc Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To enable students to record routine NMR spectra on Bruker spectrometers without supervision.

Course contents
Sample preparation, deuterium lock, shimming, pulse calibration, determination of spectral window and other measurement parameters. Recording of routine ^{1}H and ^{13}C NMR spectra. Software use: calibration, integration, plotting. Selective homonuclear decoupling, water signal suppression, NOE difference experiment. ^{13}C NMR measurements with broad-band proton decoupling, gated decoupling, quantitative ^{13}C NMR. J-modulated spin-echo ^{13}C experiment.

Recommended reading
1. P. J. Hore: Nuclear Magnetic Resonance, Oxford University Press, 1995
2. Bruker user's manual

Teaching methods
Introduction to the use of NMR spectrometer. The teacher explains and demonstrates each step of the measurement. Then the students are allowed to practice under supervision.

Assessment methods
At the end of the course there is a practical examination, *ca*. 1 hour. The student has to prove that she/he can handle the spectrometer on her/his own. The student has to record both ^{1}H and ^{13}C spectra on a sample provided by the teacher.

Course title:	**Reaction Mechanisms**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Somsák, László**
Prerequisites:	**Synthetic Methods in Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To make students familiar with the common methods used for the interpretation of the course and selectivity of organic chemical reactions (FMO theory, stereoelectronic effects, principle of least motion) and to overview heterolytic, homolytic and pericyclic reactions is given with an emphasis on the latter two types as well as practical applications.

Course contents
Frontier molecular orbitals, their use in understanding chemical reactions: the Klopman-Salem equation. Stereoelectronic effects and their manifestations. Baldwin's rules. The principle of least motion. Types of mechanisms and reactions, reactive intermediates (formation, stability, structure and reactions of carbocations, carbanions, carbon-centered radicals, carbenes, nitrenes). Pericyclic reactions and interpretation methods (orbital correlation diagrams, FMO method). Electrocyclic reactions. Cycloaddition reactions of normal and inverse electron demand, regio- and stereoselectivity, Lewis acid catalysis, position and periselectivity. 1,3-Dipolar cycloaddition. Cheletropic reactions, sigmatropic rearrangements. Solvent effects in pericyclic reactions. Pericyclic reactions in biological systems. Understanding pericyclic reactions based on the aromaticity of transition states. Free radicals and their production. Chemical initiators. Elementary reactions of free radicals. Radical reactions of chain and non-chain mechanisms. Thermodynamic and kinetic stability of carbon radicals, effects of substituents on the radical centers. Abstraction, addition, fragmentation and rearrangement reactions of free radicals. Synthetic application of radicals, requirements for selectivity and reactivity. Identifying radical reactions. Basic types of organic photochemical reactions.

Recommended reading
1. Fleming, I. *Frontier Orbitals and Organic Chemical Reactions*, Wiley, 1976.
2. Rauk, A. *Orbital Interaction Theory of Organic Chemistry*, Wiley, 1994.
3. Kirby, A. J. *Stereoelectronic Effects*; Oxford University Press: Oxford, 1996.
4. Parsons, A. F. *An Introduction to Free Radical Chemistry*; Blackwell Science: Oxford, 2000.

Teaching methods
Lectures at the board illustrated by overhead projection and/or PowerPoint presentations, which are handed out to students. Extensive use of molecular stereomodels.

Assessment methods
Oral examination at the end of the semester.

Course title:	**Asymmetric Syntheses**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Patonay, Tamás**
Prerequisites:	**Reaction Mechanisms**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the fundamentals and methods of stereoselective (enantio- and diastereoselective) synthesis through examples involving biologically active and natural compounds.

Course contents
Kinetic asymmetric transformations: concept and types. Kinetic resolution. Enzyme-catalyzed kinetic resolution. Asymmetric decay reactions. Chiral pool: overview of important chiral reagents in synthesis (amino acids, hydroxyacids, alkaloids, terpenes, carbohydrates). Reagents and auxiliary materials obtained by the modification of their functional groups, synthesis of enantiopure/enantiomerically-enriched target compounds without the generation of novel stereogenic centers. Basics of asymmetric synthesis: Cram's rule, Prelog's rule. Types of asymmetric syntheses: first generation (substrate-controlled), second generation (auxiliary-controlled), third generation (reagent-controlled), and fourth generation (catalyst-controlled) methods. Multiple stereodifferentiation.

Recommended reading
1. E. L. Eliel, S. H. Wilen: Stereochemisty of Organic Compounds. Wiley, New York, 1994.
2. R. A. Aitken, S. N. Kilényi: Asymmetric Synthesis, Blackie Academic, London, 1992.
3. G. Procter: Stereoselectivity in Organic Synthesis, Oxford University Press, Oxford, 1998.
4. R. S. Ward: Selectivity in Organic Synthesis, Wiley, Chichester, 1999.

Teaching methods
Multimedia teaching techniques based on Powerpoint presentations and stereochemical models are used. Problem solving parts are also included to extend the knowledge of the students at certain areas.

Assessment methods
Anonymous written examination (1 ½ - 2 hours) at the end of the semester. Questions to be answered include both concepts and problem solving. The corrected and marked tests can be viewed by the students on request. In the case of an unacceptable result of the written examination, the repeated first exam could be take orally. The second repeated exam will be done in the presence of a three-membered committee.

Course title:	**Modern Synthetic Methods in Polymer Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Zsuga, Mikós**
Prerequisites:	**BSc Macromolecular Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present special materials and synthetic methods used in modern polymer chemistry.

Course contents
Methods for laboratory work in moisture and air-free settings: pin to pin, dry box, vacuum line techniques. Ionic polymerization: structures, stability and stereochemistry of carbanion and carbeniumion compounds; mechanism and kinetics of anionic and cationic polymerization. Macromonomers, macroinitiators, mecroiniferters. Polycondensation. Synthesis methods for well-defined systems: living ionic polymerization, living radical polymerization, atom transfer polymerization, block copolymers, polymer networks with controlled structures. Polymer systems: stability of polymer latex, emulsion and suspension polymerization.

Recommended reading
1. Rempp P. and Merrill E. W.: Polymer synthesis, Hüthig and Wepf, Basel (1991)
2. Hsieh H. L. and Quirk R. P.: Anionic polymerization, Principles and practical applications, Mercel Dekker Inc., New York (1996)
3. Mishra M. K.: Macromolecular design, concept and practic, Polymer Frontiers International Inc., Hopewell Jct., New York (1994)
4. Alexandridis P. and Lindman B.: Amphiphilic block copolymers, Elsevier, Amsterdam (2000)

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Introduction to Pharmacology**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Pórszász, Róbert**
Prerequisites:	**BSc Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present a chemistry based view of pharmacology with emphasis on drug action mechanisms and structure-activity relationships.

Course contents
Pharmacokinetics: absorption, distribution, metabolism, clearance, biological availability, bioequivalence, dosage, formulation, binding to protein, distribution space, half life, Cmax, saturation dose, maintenance dose, clearance, phase I, phase II, metabolic reactions. Pharmacodynamics: molecular bases and targets non-receptoral and receptoral drug action, receptor types and pharmacology, secondary messenger systems, drug-receptor interactions, affinity, intrinsic activity, agonism, antagonism (competitive and noncompetitive), reserve receptors, desensitization, tachyfilaxy. General pharmacophysiology of the autonomous nervous system. Colinerg transmission (M and N receptors), noradrenerg transmission, (α anf β receptors), nitrogen monoxidem, autakoids. Pharmacology of the heart and the vascular system. Antiarrhytmic medicines, drugs with positive inotropic effects, drugs acting on muscles.
Pharmacology of diuretics. Antihyperlipidemic drugs. Drugs acting on clotting and blood formation. Inflammatiion pharmacology. Asthma bronchiale and respiratory system drugs. Drugs acting on the gastrointesinal apparatus. Principles of endocrin pharmacology (pharmacology of obesity, diabetes, thyroid functions and sexual organs). Drugs acting on the central nervous system: antiepileptic, sedatohipnotic drugs, general and local anesthetics, Parkinson's disease, Alzheimer's disease, antipsichotic drugs, narcotics. Basics of antibacterial, antiviral, antifungal, and antiprotozoon chemotherapy. Cancer chemotherapy.

Recommended reading
1. H. P. Rang, M. M. Dale, J. M. Ritter, P. K. Moore: Pharmacology, Fifth edition, Churchill Livingstone, 2003.
2. B. G. Katzung: Basic & Clinical Pharmacology, Ninth edition, McGraw-Hill, 2003.
3. Goodman & Gilman's The Pharmacological Basis of Therapeutics, Tenth edition, McGraw-Hill, 2001.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Modern Gas and Liquid Chromatography I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**1**
Semester:	**2**
Number of credits:	**3**
Name of lecturer:	**Deák, György**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present modern gas and liquid chromatographic methods.

Course contents
Parts and operation of gas chromatographs: sample introduction, detectors. Column types, column technologies. Development and use of gas chromatographic methods. Column selection, interchangeability of columns from different manufacturers. Determination and calculation of chromatographic parameters. Operation of gas chromatographs. Data collection and processing. Common integrators and data handling systems. Qualitative and quantitative analysis. Error possibilities, troubleshooting. GC-MS techniques, their application, and data evaluation.
Parts and operation of liquid chromatographs. HPLC techniques. Column types, column technologies. Selection of stationary phases. Isocratic and gradient methods. Separation of chiral compounds. Development and use of HPLC methods. Determination and calculation of chromatographic parameters. Operation of liquid chromatographs. Data collection and processing. Common data handling systems. Qualitative and quantitative analysis. Error possibilities, troubleshooting. HPLC-MS techniques, their application and data evaluation.
Principles of size-exclusion (SEC, GPC, GFC) chromatography. Possibilities of macromolecular molar weight determination. Physicochemical principles of signal detection.
Applications: pre-treatment of environmental samples for GC and HPLS analysis. Solid phase microextraction and its application possibilities. Analysis of aerosols, water and soil samples by GC, HPLC, GC-MS, and HPLC-MS. Pre-treatment of human samples (blood and urine) for GC and HPLC analysis. Determination of pharmacokinetic parameters.

Recommended reading
1. Balla József: A gázkromatográfia analitikai alkalmazásai, Budapest, 1997.
2. Fekete Jenő: Folyadékkromatográfia, Budapest (Jáva-98 Kft.) 2003.
3. Dinya Zoltán: Szerves tömegspektrometria, DE, 2001.
4. L.R. Snyder, J.J. Kirkland, J.L. Glajch, Practical HPLC Method Development, Wiley-Interscience, 1997.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Modern Gas and Liquid Chromatography II.**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Deák, György; Kiss, Attila**
Prerequisites:	**Modern Gas and Liquid Chromatography I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide student with direct laboratory experience in gas and liquid chromatography.

Course contents
Basic operation of a typical liquid chromatography evaluation software. Sample pre-treatment for SPE technique. Chromatographic molecular weight determination of macromolecules, application of GC-MS techniques in organic structure determination. Use of a characteristic chromatographic software (Solvent Manager System). Development of an analytical method with the SPE method. Setting up a calibration curve for determining caffeine in tea, coffee and soft drinks. Calculation of chromatographic parameters (resolution, number of theoretical plate) from chromatograms. Measurement of recovery percent.
Calibration of SEC chromatographs with polystyrene standard samples. Determination of full inclusion and full exclusion regions. Determination of the molecular weight of an unknown polymer sample (PVC, PIB, or polystyrene). Simulation of chromatographic errors.

Recommended reading
1. Zsuga Miklós: Makromolekuláris kémia, Egyetemi jegyzet, Debrecen, 2003
2. D. A. Skoog, J. J. Leary: Principles of instrumental analysis, Saunders Publishing, New York-Tokyo, 1992
3. G. Odian: Principles of polymerization, McGraw-Hill, New York, 1983.
4. Fekete Jenő: Gtakorlati útmutató a HPLC használatához, Budapest (Jáva-98 Kft.), 2005.

Teaching methods
Teaching in small groups. Students can make their own measurements on state-of the art GC and LC systems including sample preparations, data collection and data analysis.

Assessment methods
Short test at the beginnin of each laboratory session. Review of laboratory notes.

Course title:	**Modern Mass Spectrometry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Kéki, Sándor**
Prerequisites:	**Methods of Structure Determination**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the physical and chemical background of modern ionization methods used in mass spectroscopy and their use in chemical structural determination.

Course contents
Ion sources, mass analyzers, detectors. Principles and applications of the MALDI-TOF MS method: determination of molar mass, molar mass distribution, and functionality of (natural and synthetic) polymers. Electrospray methods: ESI, APCI, APPI. Online (LC, GPC)-ESI MS. MALDI MS/MS and ESI-MS/MS (PSD, CID) methods and their application for the structure determination of peptides, oligosaccharides and small molecules. Additional ionization methods: *DART* technology.

Recommended reading
1. Dinya Zoltán: Szerves tömegspektrometria, Kossuth Egyetemi Könyvkiadó, 2001
2. Richard B. Cole**:** Electrospray Ionization Mass Spectrometry: Fundamentals, Instrumentation, and Applications, Wiley, 1997
3. H. Pasch, W. Schrepp: MALDI-TOF Mass Spectrometry of Synthetic Polymers, Springer Laboratory, 2003
4. Q. M. A. Niessen: Liquid Chromatography-Mass Spectrometry, Marcel Dekker, Inc, 1999

Teaching methods
Teaching includes Multimedia presentations to facilate the understanding of processes occurring in a mass spectrometer. Problem-solving exercises for several important mass spectrometric calculations and structure determination of various compounds are also implemented.

Assessment methods
The assessment carried out int he form of written examinations at the end of semester. The marking of the written examination is checked by a second qualified examiner. The maximum time allowed for written examinations is 2 hours.

Course title:	**High Performance Synthetic Methods**
Course code:	**TKMG....**
Type of course:	**seminar and laboratory practice**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Kónya, Krisztina**
Prerequisites:	**Synthetic Methods in Organic Chem. II.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the principles of combinatoric chemistry and other high-performance synthetic methods.

Course contents
History of combinatorial chemistry: the role of efficiency in pharmaceutical research and development. Orthodox and parallel syntheses, compound libraries. Split-and-mix techniques. Synthesis methods in solution and on solid phases, advantages and drawbacks. Resin-bound reagents. Structure determination of products. Activity testing in solution and solid phase. Automated syntheses, multichannel synthetic robots. Information technology, data processing. Applications in organic chemistry, pharmaceutics and materials science. Overview of theoretical background. Microwave-activated solution and solvent-free syntheses. Overview of microwave instruments, application techniques. Applications in organic chemical syntheses: condensation, ring closure, Heck reaction, Mitsunobu reaction, formation of C-C and C-heteroatom bonds.

Recommended reading
1. Bata Imre, Hermecz István: Kombinatorikus kémia, Akadémiai Kiadó, Budapest, 2000
2. C. O. Kappe, A. Stadler: Microwaves in Organic and Medicinal Chemistry, Wiley-VCH, Weinheim, 2005.
3. G. Jung: Combinatorial chemistry, Wiley-VCH, Weinheim, 1999.

Teaching methods
Teaching in small groups. tutorial system in problem-solving classes.

Assessment methods
Grading is based on several mid-term tests.

Course title:	**Modern 1D and 2D NMR Methods**
Course code:	**TKML....**
Type of course:	**seminar and laboratory practice**
Level of course:	**compulsory in synthetic chemistry specialization**
Year of study:	**2**
Semester:	**3**
Number of credits:	**3**
Name of lecturer:	**Kövér, Katalin**
Prerequisites:	**Methods of Structure Determination, NMR Operator Training**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to the theory and practice of important 1D és 2D NMR methods and to enable them to carry out measurements without supervision.

Course contents
Short overview of theoretical foundations. Introduction to the use of different NMR methods through hands-on examples.
1D NMR methods: selective TOCSY, selective NOE, Watergate experiment.
2D NMR methods: COSY, TOCSY, NOESY, ROESY, HSQC, HMBC.

Recommended reading
1. P. J. Hore: Mágneses Magrezonancia, Nemzeti Tankönyvkiadó, (fordító: Szilágyi László)
2. T. D. W. Claridge: High-Resolution NMR Techniques in Organic Chemistry, Elsevier Ltd. 1999
3. A. E. Derome: Modern NMR Techniques for Chemistry Research, Pergamon Press, Oxford, 1987
4. S. Berger, S. Braun: 200 and More NMR Experiments. A practical course, Wiley-VCH, 2004

Teaching methods
The teacher explains and demonstrates each type of the NMR experiments. Then the students are allowed to practice under supervision. Finally, they solve structural problems with the combined use of different NMR methods.

Assessment methods
At the end of the course there is a practical examination, *ca*. 1 hour. The student has to set up one of the specified *2D homonuclear* correlation experiments (COSY, TOCSY, NOESY, etc.). Then she/he has to set up, accomplish and process another experiment, namely one of the specified *2D heteronuclear* correlation experiments, such as HSQC or HMBC. (Or other way around, set up *2D heteronuclear* experiment, and record and process *2D homonuclear* spectrum).

Course title:	**Glycobiochemistry**
Course code:	**TBME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Szurmai, Zoltán; Kerékgyártó, János**
Prerequisites:	**BSc Biochem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To overview the occurrence and biological role of simple and complex carbohydrates.

Course contents
Occurrence of carbohydrates. Glycolipids, glycoproteins, peptidoglycanes. Biological information stored i carbohydrates - glycibiology. Structure of cell surface carbohydrates in bacteria, viruses, tumor cells and human tissues and its connection with diseases - glycopathology. Modern methods for oligosaccharide synthesis.

Recommended reading
1. Glycoscience – Chemistry and Chemiocal biology, Springer Verlag, 2001.
2. Essentials of Glicobiology, Cold spring Harbor, New York, 1999.
3. J. M. Berg, J. L. Tymoczko, L. Stryer: Biochemistry, W.H. Freeman and Co., 2002.

Teaching methods
Multimedia teaching techniques

Assessment methods
Assesment is carried out with written examination at the end of semester (duration is 1 hour). If the written examination is failed, an oral examination is available.

Course title:	**Molecular Engineering**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Keserű, György Miklós**
Prerequisites:	**BSc Organic Chem., BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the modern methods of computer-aided molecular engineering and design.

Course contents
Introduction to pharmaceutical research. Development of drug design. Computer-assisted models of molecular structure. Mathematical description of molecular geometry and stereochemistry. Theoretical foundations of molecular mechanics. Basic equation of molecular mechanics, details of energy calculation. Introduction to field-based conformational analysis. Study of structure-activity relationships. QSAR models (Free-Wilson analysis, Hansch analysis, COMFA analysis). Structure-based design. Calculation of ADME parameters. Virtual screening in pharmaceutical research. Molecular mechanics and conformational analysis. Quantitative structure-activity relationships. Macromolecular calculations.
Practical demonstration: QSAR models in modern pharmaceutical research. Virtual screening.

Recommended reading
1. Keserű György Miklós, Náray-Szabó Gábor: Molekulamechanika, A kémia újabb eredményei 80. kötet, Akadémiai Kiadó, 1995
2. György M. Keserű, István Kolossváry: Molecular Mechanics and Conformational Analysis in Drug Design, Blackwell Science, 1999
3. Keserű György Miklós, Kolossváry István: Bevezetés a számítógépes gyógyszertervezésbe, A kémia újabb eredményei 99. kötet, Akadémiai Kiadó, 2006

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Carbohydrate Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Somsák, László**
Prerequisites:	**Synthetic Methods in Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide an introduction into the properties of carbohydrates and their derivatives becoming more and more important in biology and for the industry and present a basic knowledge for more advanced chemical and biochemical studies, getting familiar with glycoscience.

Course contents
Occurrence and biological functions of carbohydrates. Classification and application possibilities of carbohydrates. Constitution and configuration of monosaccharides, methods of depiction. Basics of carbohydrate nomenclature. Structural properties of oligo and polysaccharides. Microheterogeneity. Application of instrumental methods (X-ray diffraction, UV, IR, MS spectrocopies) in glycochemistry. Application of NMR spectroscopy in the structure elucidation of carbohydrates. Optical rotation methods. Conformational analysis of monosaccharides. Anomeric effects (endo, exo, and inverse) and their generalization. Reactions of free sugars in aqueous medium; oxidation, reduction; reactions with *N*-, *S*-, and *C*-nucleophiles. Reactions of free sugars with alcohols: formation and hydrolysis of glycosides. Carbohydrate esters and ethers. Carbohydrate acetals and ketals. Preparation and reactions of peracetylated monosaccharides. Preparation and reactions of glycosyl halides. Formation of unsaturated bonds and additional carbonyl groups in carbohydrates. Nucleophilic substitution on non-anomeric carbons; preparation and ring opening of epoxides.

Recommended reading
1. Levy, D. E.; Fügedi, P. *The Organic Chemistry of Sugars*; CRC Press: Boca Raton, 2006.
2. Lindhorst, T. K. *Essentials of Carbohydrate Chemistry*; Wiley-VCH: Weinheim, 2000.
3. Collins, P. M.; Ferrier, R. J. *Monosaccharides - Their Chemistry and Their Roles in Natural Products*; John Wiley & Sons: Chichester, 1995.

Teaching methods
Lectures at the board illustrated by overhead projection and/or PowerPoint presentations, which are handed out to students. Extensive use of molecular stereomodels. Continous discussions during the lectures.

Assessment methods
Oral examination at the end of the semester.

Course title:	**Agrochemicals**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Patonay, Tamás**
Prerequisites:	**Synthetic Methods in Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To overview the pesticides used in agriculture, their chemical structure, their structure-activity relationships, and the mechanisms of their action. Some typical synthetic methods for each family are also included.

Course contents
Concepts in agrochemistry: classification of pesticides based on their effects and target organisms, important formulation methods. Insecticides, larvicides, miticides, and akaricides. Fungicides. Inorganic, organometallic and sulfur-containing compounds. Other fungicides: carboxanilides, imides, triazole and imidazole derivatives, antibiotics. Herbicides and plant growth regulating agents: amides, carbonic acid derivatives, diphenyl ethers, N-heterocyclic compounds. Antidotes. Classical groups of active compounds: chlorinated hydrocarbons, phosphoric acid derivatives, carbamates. Pyrethroids, possibilities of hormonal control. Pheromones. Qualitative and quantitative structure-activity relationships. Changes in the use of different groups of active ingredients, main trends and perspectives of development. Enantiopure active substances.

Recommended reading
1. W. Kramer, U. Schirmer (eds.): Modern Crop Protection, Vol. 1-3, Wiley-VCH, Weinheim, 2007.
2. K. A. Hassall: The Biochemistry and Uses of Pesticides, MacMillan, London, 1990.
3. K. H. Büchel (ed.): Chemistry of Pesticides, Wiley, New York, 1983.
4. R. J. Cremlyn: Agrochemicals. Preparation and Mode of Action. Wiley, Chichester, 1991.

Teaching methods
Multimedia teaching techniques based on Powerpoint presentations.

Assessment methods
Anonymous written examination (1 ½ - 2 hours) at the end of the semester. Questions to be answered include both concepts and syntheses. The corrected and marked tests could be viewed by the students on request. In the case of an unacceptable result of the written examination the first repeated exam could be take orally. Second repeated exam will be done in the presence of a three-membered committee.

Course title:	**Natural O-Heterocyclic Compounds**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**2**
Semester:	**4**
Number of credits:	**3**
Name of lecturer:	**Antus, Sándor**
Prerequisites:	**Synthetic Methods in Organic Chem. I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students into the chemistry of flavonoids.

Course contents
Flavonoids as the most important members of natural oxygen-heterocyclic compounds. Classification of flavonoids, their characteristic biosynthesis, structure determination, total synthesis, physiological effects, biogenetic and chemical connections between classes. Details of the chemistry of phenols. Stereochemistry of flavanoids.

Recommended reading
1. R. C. Elderfield (Ed.): Heterocyclic Compounds Vol.2., Polycyclic Five- and Six-Membered Compounds Containing One O or S Atom, Wiley, New York, 1951.
2. G. P. Ellis (Ed.): Chromenes, Chromanones and Chromones, Wiley, New York, 1977.
3. J. B. Harborne, T. J. Mabry, H. Mabry (Eds.): The Flavonoids, Chapman & Hall, London, 1975.
4. J. B. Harborne, T .J. Mabry, H. Mabry (Eds.): The Flavonoids: Advances in Research, Chapman & Hall, London, 1982;
5. J. B. Harborne: The Flavonoids: Advances in Research since 1980, Chapman & Hall, London, 1988.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Chemistry and Society**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1 or 2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Lente, Gábor**
Prerequisites:	**none**
Language of instruction:	**Hungarian or English**

Objective of the course
To give an introduction into ways of thinking about the role of chemistry in society, the impact of society on chemistry, and certain philosophical aspects of chemistry.

Course contents
The role of science in connecting the ideological and economic spheres of human socity. Science as an economic asset, the scientific-technological revolution. Results and problems of technology development, possibilities of technology control. Chemistry as a tool to understand the structure and changes in the material world. Hierarchy and classification of the individual and collective structure in the inanimate, living and human world from quarks to metagalaxies, from colloids to culture. Carbon as the star of elements. The large number of carbon compounds and their sources. Possibilities of preparing living systems. The consequences of cloning in society. Chemistry as a tool for improving living conditions. Development in food industry, food additives, preservation, coloring, pre-cooked food, modified natural food, mass production of artificial food. Medicines, their production, and consequences of using pharmaceuticals. Chemistry as a cleaning tool. Traditional soaps, natural and artificial washing powders and dishwashing liquids. Enzymatic washing agents. Disinfectants. Cosmetics. Harmful effects of chemistry and ways to avoid them. Water pollution and water treatment. Sources of air pollution, types of pollutants. Development of different means of transport, advantages and drawbacks of motorization in society. Carcinogenic, allergenic, hallucinogenic materials and alcohol as chemicals and agents with impact on society.

Recommended reading
1. Rádi P.: Kísérlet a mozgásformák rendszerének korszerű leírására, Magyar Filozófiai Szemle. 1967. (369-406 o.)
2. Mészáros E.: Bevezetés a környezettudományba, Akadémiai Kiadó, Bp., 2004.
3. Egyed L. (szerk.): A változó világegyetem, Közgazdasági és Jogi Könyvkiadó, Bp., 1976.
4. Chemistry in Context: Applying Chemistry To Society, American Chemical Society, 2005
5. http://chemincontext.eppg.com/

Teaching methods
Multimedia teaching techniques. Discussion in small groups.

Assessment methods
Written exam at the and of the semester based on simple and multiple choice test questions.

Course title:	**Mathematical Methods in Chemistry**
Course code:	**TKMG....**
Type of course:	**problem-solving seminar**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**2**
Name of lecturer:	**Póta, György**
Prerequisites:	**BSc Mathemathics, BSc Informatics**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce and practice the different mathematical methods used in chemistry, especially in high-performance instrumental methods.

Course contents
Function transformations and their applications in instrumental methods.
ordinary and partial differential equations in reaction kinetics, the description of molecular motions, and in quantum mechanics. Analytical and numerical solutions and software used. Fitting, statistical applications. Experiment planning.

Recommended reading
1. Ja. B. Zeldovics, A. D. Miskisz: Az alkalmazott matematika elemei, Gondolat, Budapest 1978.
2. A Műszaki Matematikai Gyakorlatok, BME Budapest egyes kötetei
3. Kemény Sándor, Deák András: Kísérletek tervezése és értékelése, Műszaki Könyvkiadó, Budapest 2002.
4. S. Strobel, V. Elling: LINUX, Kossuth Kiadó, Budapest 2000.
5. György Póta: Mathematical Problems for Chemistry Students, Elsevier, 2006, ISBN-10: 0-444-52793-6

Teaching methods
Problem-solving classes. Multimedia teaching techniques

Assessment methods
Written assessment consisting of problem solution.

Course title:	**Computational Quantum Chemistry**
Course code:	**TKMG....**
Type of course:	**computer practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**2**
Name of lecturer:	**Póta, György**
Prerequisites:	**BSc Theoretical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To use the quantum chemical methods presented in theoretical courses in solving actual problems computationally.

Course contents
Softwares suitable for quantum chemical calculations, and their use to solve problems by theoretical methods. Study of the geometry and other characteristic parameters of molecules. Thermodynamics of reactions. Different types of reactions mechanisms. Condensed phase calculations.

Recommended reading
1. Veszprémi Tamás, Fehér Miklós: *A kvantumkémia alapjai és alkalmazása*, Műszaki Könyvkiadó, 2002.
2. Christopher J. Cramer: *Essentials of Computational Chemistry*, Wiley, 2002.

Teaching methods
Computer practice in small groups.

Assessment methods
Assessment is based on solving a take-home final quantum mechanical problem.

Course title:	**Computational Image Processing**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, István**
Prerequisites:	**BSc Informatics**
Language of instruction:	**Hungarian or English**

Objective of the course
To give an overview of digital image processing and its use with some chemical examples.

Course contents
Theory of vision. The model used in image processing. Specific tools in image processing. Production and presentation of a digital image. Image improvement methods. Spot search and analysis. Image classification, statistic and syntactic shape recognition, texture analysis. Optical character recognition. The use of image processing through scientific and medical examples, object counting, description and analysis of corrosion phenomena and porous materials. Application in cartography and space exploration. Diagnostic applications: interactive analysis of pathological samples, DNA analysis, diagnostic analysis of ultrasound imaging. Industrial and system control applications. Military and forensic aspects of image processing.

Recommended reading
1. *Computers: An Introduction to Hardware and Software***;** by Larry L. Wear, James R. Pinkert (Contributor), William G. Lane (Contributor); McGraw-Hill Higher Education; February 1991; ISBN 0070686742;

Teaching methods
Multimedia teaching techniques, teaching in small groups, computer practice.

Assessment methods
Oral or written examination.

Course title:	**Surface Physics**
Course code:	**TFME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Erdélyi, Gábor**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present and interpret important surface phenomena in materials science and nanotechnology.

Course contents
Classification of surfaces, internal and external surfaces, grain and phase boundaries. basic crystallography and thermodynamics of surfaces. Basic models of surfaces, surface energy, equilibrium crystal shapes, Wulff law.
Structure of small- and large-angle grain boundaries. Special grain boundaries, structural models, energy of grain boundaries. Phase boundaries. Models of atomic fit, misfit conception. Coherent and incoherent phase boundaries.
Well defined surfaces, preparation of thin layers, kinetic concepts, growth models for this surfaces.
Experimental methods of characterizing multi and nanolayers.
Segregation on external and internal surfaces, segregation kinetics.
Effect of surfaces on electron states, role of surfaces in conduction, scattering and magnetic properties. Surfaces and interfaces in metals, semiconductors and oxides, their role in semiconductins, opto-electronicm and magnetic tools (giant magnetic resistance, spintronics).

Recommended reading
1. Dr. Giber J. és szerzőtársai: Szilárdtestek felületfizikája, Műszaki Könyvkiadó, 1987.
2. J. Venebles: Introduction to surface and thin film processes, Cambridge University Press, 2000.
3. K-N Tu, J.W. Mayer, L.C. Feldman: Electronic thin film science, Macmillan Publ. Co., 1992.
4. H. Lüth: Solid surfaces, interfaces and thin films. Springer, 2001.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Metals and Ceramics**
Course code:	**TFME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Erdélyi, Gábor**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the properties, characteristic changes and technological applications of metals and structural or functional ceramics based on crystallographic and structural information.

Course contents
Crystal structure of ceramics: oxides, nitrides, carbides. Experimental methods for orientation, structure, and texture characterization. Faults in ionic compounds. Faults, fault reactions, fault equilibria, Brouwer diagram, compensation of stoichiometric deviations. Ceramics as gas sensors.
Atom and charge transport in solid phase. Diffusion in non-stoichiometric oxides. relationship between electric conductivity and fault structure.
Mechanical properties, mechanism of plastic shape change, shaping and hardening. Re-crystallization and grain growth. Crystallization in metallic and non-metallic system.
Capillary phenomena, sintering. Changes in solid phase, spinodial separation. Non-diffusion controlled changes in metals and ceramics.
Preparation of important structural or functional ceramics, changes in the structure during technological steps. Improving the durability of ceramics. Connection between mechanic, thermal, optical and electrical properties.
Metal-ceramics bonds, ceramics-based composite materials, biocompatible ceramics.

Recommended reading
1. Chavarria J. Kerámia, Novella Budapest, 1996.
2. Gottstein, G.: Physikalische Grundlagen der Materialkunde, Springer, 2001.
3. Brook, RG.: Coincise encyclopedia of advanced ceramic materials, Pergamon, Oxford, 1991.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Process Engineering Laboratory**
Course code:	**TKME....**
Type of course:	**laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nemes, Sándor; Nagy, Miklós**
Prerequisites:	**BSc Chemical Technology II.**
Language of instruction:	**Hungarian or English**

Objective of the course
To practice experimental and calculation methods in process engineering.

Course contents
Grinding on desintegrator, wheel and ball grinder. Sieving, determination of particle size distribution. Drying. The study of the kinetics of drying and determination of humidity. Distillation. Distillation experiments in a steam-heated Lampart distiller: (handling of the Lampart distiller), cleaning of solvent-polluted water with distillation. Water softening: lime-soda and phosphate methods for softening in pilot scale reactor and ion exchange equipment. Rectification. Mixing. Scaling of mechanical mixers. Filtration and study of different types of filtration. Fluidization.
Studies of heat transfer processes. Time-distribution in different reactors. Liquid-liquid extraction. Pilot size extraction: operation of a reversed-flow extractor, removal of oil from water with a solvent. Wiped film evaporation of aqueous solutions and solvent evaporation. Experiments with filled and separated space absorbers: absorption of carbon dioxide in water. Structural materials. Properties of plastics.

Recommended reading
1. F. Patat – K. Kirchner: Praktikum der Technischen Chemie, 4. Auflage, Walter de Gruyter. Verlag, Berlin 1986.
2. F. Patat – K. Kirchner: Ipari kémiai praktikum, Műszaki Könyvkiadó, Budapest, 1971.
3. J.M. Coulson, J.F. Richardson, R.K. Sinnot: Chemical Engineering, Pergamon, Oxford, 1983

Teaching methods
Weekly laboratory practice in groups of 2-3 based on previously given practice guides.

Assessment methods
Assessment is based on written lab reports. The lab reports are checked by a second qualified teacher.

Course title:	**Applied Coordination Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Brücher, Ernő**
Prerequisites:	**BSc Inorganic Cehm., BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to coordination compounds used in various fields of everyday life.

Course contents
Complexing agents in ion exchange chromatography and extraction: isolation of rare earth metals, radiochemical separation methods. Metal complexes in agriculture: fertilizers with trace elements and pesticides. Complexes in energetics. Use of complexing agents in heating systems for performance enhancement or cleaning. Use of chelating ligands in medical diagnostics and therapy. Removal of toxic heavy metals from the body and introduction of essential metals using complexing agents. Connections between biological effects and complex formation properties, ligand design. Metal complexes in isotopic diagnostics and cancer treatment. Paramagnetic complexes as contrast agents in NMR tomography.

Recommended reading
1. D.M. Taylor, D.R. Williams: Trace elements in medicine and chelation therapy, The RSC, 1995.
2. R.B. Lauffer: Paramagnetic metal complexes as water proton relaxation agents, Chemical Review, 87, 901-927, 1987.
3. Környei József: A nukleáris medicina fizikai kémiai alapjai, Egyetemi kiadó, Debrecen, 1997.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Complexes of Macrocyclic Ligands**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Brücher, Ernő; Lázár, István**
Prerequisites:	**BSc Inorganic Chem., BSc Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the synthesis and practical applications of macrocyclic ligands.

Course contents
Discovery of macrocyclic complexing agents, types of ligands. Selectivity of ligands and the macrocyclic effect. Functional groups on macrocyclic rings and their role in the selectivity and stability of complex formation. Synthetic methods for the preparation of macrocyclic rings. Synthesis of functionalized macrocycles, derivatization reactions. Properties of crown ethers, cryptands and functionalized macrocycles, and the structure of their complexes. Kinetic properties of macrocyclic complexes. Practical applications of macrocyclic ligands in analytical chemistry, organic chemistry, and biology.

Recommended reading
1. Lindoy, L.F., Chemistry of macrocyclic ligand complexes, Cambridge University Press, 1989
2. R. B. Lauffer, Paramagnetic metal complexes as water proton relaxation agents, Chemical Reviews, 87, 901-927, 1987.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Special and Dangerous Materials**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Lázár, István**
Prerequisites:	**BSc Inorganic Chem., BSc. Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide information on the physical, chemical, biological and toxicological properties, environmental hazards, synthesis, characterization, safe handling, analysis, and proper destruction of drugs, toxins, explosives and other special materials that require additional knowledge for their proper handling or to avoid accidents.

Course contents
General properties of illicit drugs, special issues of drug addictology, development of dependency. Drugs and the law. Detailed description of the physical, chemical and biological properties of the most widely used illicit drugs. General human rights, environmental and legal issues of the use of toxic chemicals as weapons during the history. Classification of toxic substances (chemical weapons) based on their toxicological profile. Detailed description of the most widely known classic and modern toxic chemicals, their analysis and methods of decomposition. Basic physical chemistry of different types of rapid reactions leading to explosion. Classification of explosive materials. Low and high explosives, their most important physical, chemical and explosive properties. Synthesis, handling and decomposition of explosive materials. Civilian use of explosive materials in industry. Special measurement techniques associated with the characterization of explosives. Materials, structure, preparation, handling, storage and lawful use of pyrotechnic devices. Supertoxins of biological origin: history, occurrence in nature, toxins of exotic species. Pheromones: chemical structures and role in the social behavior of people. Practical and ecological applications of pheromones.

Recommended reading
1. Dr. Lázár István: Különleges és veszélyes anyagok, Egyetemi Kiadó, Debrecen, 2001.
2. Vilem Petr, Handbook for Explosives Engineering Students, Colorado, U.S. 2004.
3. Chemical and Biological Warfare, A Reference Handbook, Al Mauroni, ABC-CLIO, 2003.

Teaching methods
Oral lecture with consultations

Assessment methods
Oral examinations at the end of the semester. Students are provided at least a 30 minutes time for preparation then consult the examiner and answer additional or related questions. The marks are not checked by another examiner. Students are provided with the correct answers on request. The examination is the individual responsibility of the examiner.

Course title:	**Chemical Speciation**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Posta, József; Gáspár, Attila**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To overview the direct chemical speciation methods in analytical chemistry.

Course contents
Methods for the determination of the type of atoms connected to metals. Methods for the determination of the coordination and stereochemistry of metals. Vibration spectroscopy: FTIR, RAMAN. Nuclear magnetic resonance spectroscopy (^{27}Al, ^{95}Mo, etc.). ESR, Mössbauer spectroscopy, X-ray diffraction, photoelectron spectroscopy (XPS, XANES, EXAFS).

Recommended reading
1. Posta J.: Elemek kémiai formáinak vizsgálatára alkalmas kapcsolt méréstechnikák, Zárai Gy (szerk.) Az elemanalízis modern módszerei, Akadémiai Kiadó, Bp., 2006. (551-601 o.)
2. R. Cornelis, J. Caruso, H. Crews, K. Heimann (Eds.): Handbook of Elemental Speciation, John Wiley and Sons, Weinheim, 2003.
3. L. Ebdon, L. Pitts, R. Cornelis, H. Crews, O. F. X. Donard, Ph. Quevauviller (Eds.): Trace Element Speciation for Environment, Food and Healt, Cambridge, 2001.
4. Syllabuses

Teaching methods
Making efforts to maintain the interests of the students during the whole lecture using multimedia like animations, video to teach techniques. The slides of the whole lecture (in ppt) are available in the web. The last part (few minutes) of each lecture is devoted to discussions with the students

Assessment methods
The assessments are carried out with oral examinations at the end of the semester. The examiner is the the lecturer.

Course title:	**Complex Equilibria Laboratory**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Farkas, Etelka; Fábián, István; Tóth, Imre**
Prerequisites:	**BSC Inorganic Chem., BSc Physical Chem., BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students to the practice of studying complex equilibria.

Course contents
1. pH-metric determination of equilibrium constants. Determination of the compositions and stability constants of a few complexes in aqueous solution. Basic concepts in equilibrium chemistry through the application of pH-metry. Evaluation of data using specialized software. 2. CD spectroscopy of metal complexes through testing selected copper(II) complexes. 3. Characteristic absorption spectra of transition metal complexes. Determination of equilibrium constants by UV-vis spectrophotometry. 4. Investigation of equilibrium dynamics with NMR relaxation methods. Exploration of selected concepts of coordination chemistry through paramagnetic NMR relaxation. 5. Investigation of equilibrium dynamics with NMR line shape analysis. Fast and slow exchange, complete line shape analysis, deconvolution.

Recommended reading
1. I. Nagypál and M. T. Beck, Chemistry of Complex Equilibria, Akadémiai Kiadó, Budapest, 1990.
2. Burger K., Modern koordinációs kémiai vizsgálómódszerek, Akadémiai kiadó.
3. K. Nakamoto, P.J. McCarthy, Spectroscopy and structure of Metal Chelate Compounds, John Wiley and Sons, 1968.

Teaching methods
Teaching in small groups.

Assessment methods
Each laboratory practice is graded individually based on the laboratory notes and oral consultations with the student. The final course grade is given as the average of individual laboratory grades.

Course title:	**Biocolloid Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Novák, Levente**
Prerequisites:	**BSc Colloid Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To deepen the students' understanding of colloid chemistry principles through a detailed study of biological examples and enable them to solve problems with a practical approach based on colloid chemistry.

Course contents
The importance of the colloid state in biology. Colloid chemical problems of the emergence of life. Formation of surfaces. Micelles, monomolecular films, coacervation phenomena, formation of double lipid membranes. Artificial membranes and their importance. Surface phenomena on different levels: cells, individuals and higher. Adsorption phenomena in biological systems. Preparation of foams, emulsions, sols and their destructions in different biological, medicinal, and pharmaceutical processes. Tensides as hazardous and useful surfactants. Biological macromolecules: classification, rheological phenomena and their application. The importance of sol-gel state in biology. Colloid chemistry of natural waters, soils, and the air. Adsorption phenomena and their application in environmental protection. Colloidal effects in modern analytical chemistry methods.

Recommended reading
1. D. Fennell Evans and Hakan Wennerstrom: The Colloidal Domain: Where Physics, Chemistry, and Biology Meet, 2nd Ed (Wiley 1999)

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Light Scattering Photometry**
Course code:	**TKME....**
Type of course:	**lecture and laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**1**
Name of lecturer:	**Berka, Márta**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the theory and practice of light scattering measurements.

Course contents
Lecture: Theoretical background of light scattering. Rayleigh scattering, Rayleigh-Debye scattering. Light scattering in liquids. Anisotropy. Particle size analysis based and light scattering (SLS). Mie scattering. Fundamental equations: Zimm, Berry, Debye. Scattering pattern of polydisperse systems. Scattering of absorbing particles. Dynamic light scattering (DLS). Spectral analysis. Autocorrelation function DLS in polydisperse systems. Comparison with static light scattering results. Applications.
Laboratory practice: Determination of molar mass distribution on polymer solutions by SLS. Determination of particle size distribution by DLS in typical colloid systems (sol, emulsion).

Recommended reading
1. Kerker, M. The Scattering of Light and other Electromagnetic Radiation, Academic Press, New York, 1969
2. Huglin, M. B., Light Scattering from Polymer Solutions, Academic Press, London, 1972.
3. Berne, B. J. and Pecora, R. Dynamic Light Scattering with applications to Chemistry, Biology, and Physics, New York: Wiley, 1976.
4. Finsy, R. Particle sizing by quasi-elastic light scattering, Advances in Colloid and Interface Science, 52 (1994) 79-143

Teaching methods
Lecturing and measuring practice. Multimedia is used.

Assessment methods
Practical examinations with oral questioning at the end of the course.

Course title:	**Heterogeneous Reactions I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, Noémi**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the general laws governing heterogeneous chemical processes.

Course contents
Main classes of heterogeneous chemical reactions. General laws and important variables of heterogeneous processes. Methods for surface, and interface characterization. Thermodynamics and kinetics of heterogeneous reactions. Application of the general laws through specific examples: heterogeneous isotopic exchange, solid ion exchangers, soil, contact catalysts.

Recommended reading
1. Berecz Endre: Fizikai kémia, Tankünyvkiadó, Budapest, 1980
2. P. W. Atkins: Fizikai kémia, Tankönyvkiadó, Budapest, 1992
3. Wolfram Ervin: Kolloidika, Tankönyvkiadó, Budapest, 1971
4. Szabó Zoltán: Kontakt katalizis, Akadémiai Kiadó, Budapest, 1966
5. B. C. Gates: Catalytic Chemistry, Wiley-Interscience Publication, 1992

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Heterogeneous Reactions II.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**2 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, Noémi**
Prerequisites:	**Heterogeneous Reactions I.**
Language of instruction:	**Hungarian or English**

Objective of the course
T present the general laws governing heterogeneous processes accompanied by changes in the elctrochemical potential.

Course contents
Heterogeneous processes accompanied by changes in the electrochemical potential. Equilibrium of electrode reactions. Electrochemical equilibrium in membrane/aqueous solution systems: ion exchange membranes, biological membranes. Kinetics of electrode reactions, factors influencing kinetics. Investigations with rotating electrodes. Anodic dissolution of metals. Electrochemical corrosion. Corrosion control: constructional, passive, active and transitional protection. Redox processes in soils.

Recommended reading
1. Kiss László: Az elektrokémiai fémoldódás kinetikája, Akadémiai Kiadó, Budapest
2. J.O.M. Bockris, D.M. Drazic: Electrochemical Science, Taylor&Francis, Ltd. London.
3. J.W. West, Electrodeposition and Corrosion Processes, Nostrand Co. Ltd., 1965.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Dynamic NMR Spectroscopy**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Bányai, István; Horváth-Csajbók, Éva**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the application of NMR method for problems not related to organic or biological chemistry.

Course contents
Basic concepts of NMR spectroscopy. NMR relaxation and its mechanisms. Dynamic description of equilibrium. Unified theory of relaxation and reaction dynamics: the Bloch-McConnell equation. Dynamic NMR on real, T_1 and T_2 time scale. reversible diffusion. Basic concepts of NMR tomography. NMR diffusiometry and porometry. Principles of solid-state NMR.

Recommended reading
1. A. E. Derome**:** Modern NMR Techniques for Chemistry Research (Pergamon Press) 1993
2. J. P. Hornak**:** Basics of NMR (http://www.cis.rit.edu/htbooks/nmr/bnmr.htm)
3. P. J. Hore, J. A. Jones, S Winteris: NMR: The Toolkit (Oxford University Press) 2002

Teaching methods
Lecturing and measuring practice. Multimedia is used.

Assessment methods
Practical examinations with oral questioning at the end of the course.

Course title:	**Biophysical Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Horváth-Csajbók, Éva**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To apply physical chemical concepts in biological examples.

Course contents
Thermodynamics in biology: work, heat, energy. Energy management within a cell. ATP as a fule of life. Dynamics of energy use and production in skeletal muscles. Thermodynamics of gases: physical chemistry of respiration. Physical chemistry of diving. Transport phenomena in living systems. Diffusion. Osmosis through a semipermeable membrane, dialysis. Fluidity of membranes. Membrane transport. Electrochemistry of membranes: electrochemical potential, Nernts equation. Donnan potential. Origin of membrane potential.
Equilibrium systems: principles behind equilibrium constant and their importance. Thermodynamic activity. Solubility of macromolecules, salt effects. Hydrophobicity, hydrophilicity, protein folding in micellar systems. Binding of small molecules and ions by polymers: protonation, buffer capacity, cooperative binding. Chemical kinetics: first-order reactions, reproduction of bacteria, radioactive methods of age determination. Biochemical catalysis: Michaelis-Menten (steady-state) kinetic models and its limitations, back reaction, several intermediates, several substrates. Regulation of enzyme reactions: inhibition and activation, pH effect, substrate inhibition. Photochemistry and photobiology. Photosynthesis. Physical chemistry of vision. UV radiation and its effect on DNA molecules.
Biological applications of structural investigation methods: structural determination of proteins with mass spectrometry, X-ray diffraction and NMR spectroscopy. Methods of medical imaging: CT, MRI, PET, SPECT, physico-chemical background of contrast agents.

Recommended reading
1. Bio-fizikai kémia előadások anyaga házijegyzet formában (készülőben)
2. Damjanovich, Mátyus: Orvosi biofizika Medicina Könyvkiadó, 2000
3. Chang: Physical Chemistry with Applications to Biological Systems 1981
4. Marshall: Biophysical Chemistry John Wiley & Sons, Inc. 1978

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Theoretical Physical Chemistry Problems**
Course code:	**TKMG....**
Type of course:	**problem-solving seminar**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**2**
Name of lecturer:	**Póta, György**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To deepen students' understanding of physical chemistry through problem solving.

Course contents
Advanced calculation problems from thermodynamics, phase transition, mixtures, chemical equilibria, transport processes, electrochemistry, reaction kinetics and structure of matter. Other calculation problems connected to MSc physical chemistry courses. Foundations of theoretical modeling of chemical phenomena: simplification of problems, solution techniques, software.

Recommended reading
1. P. W. Atkins: Fizikai kémia I – III, NTK, Bp. 2002.
2. J. Bares, C. Cerny, V. Fried és J. Pick: Fizikai kémiai számítások, TK, Bp. 1966
3. Nagy Károly (szerk.): Elméleti fizikai példatár, NTK, 2002, fizikai kémiai fejezetei
4. P. W. Atkins, J. de Paula: Physical Chemistry, 7th ed.; Oxford University Press: Oxford, 2002.

Teaching methods
Problem-solving classes. Multimedia teaching techniques.

Assessment methods
Written assessment consisting of problem solution.

Course title:	**Chemical Waves**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, István**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present chemical wave phenomena in detail.

Course contents
Formation of waves in chemistry. Main characteristics, types, forms of appearance, general importance. Propagation reaction fronts in gas mixtures. Propagation of combustion. Reaction fronts in solutions: autocatalytic waves, rate of propagation and wave profile, wave phenomena in excitable medium. Wave patterns in the Belousov-Zhabotinsky reaction. Stationary spatial patterns. Formation of structured patterns in homogeneous solution, Turing instability, chemical, biological and medical examples. Spatial patterns in convective physical and chemical systems. Reactor types and experimental methods for studying chemical waves, instrumental detection of the propagation of concentration gradients. Methods for the quantitative description of wave profiles. Measurement of temperature gradients: application of thermochromic phenomena, infrared image processing. measurement of additional properties, magnetic resonance imaging.

Recommended reading
1. Field, R. J.; Burger, M. (Eds.) *Oscillations and Traveling Waves in Chemical Systems*; Wiley: N.Y., 1985
2. Epstein, I. R.; Pojman, J. *An Introduction to Nonlinear Chemical Dynamics*, Oscillations, Waves, Patterns and Chaos; Oxford: N.Y., 1998
3. http://pojman.com/FP_Bibliography.html

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral exam, or problem solution based on lecture material.

Course title:	**Complex Catalysis in Organic Syntheses**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Joó, Ferenc**
Prerequisites:	**BSc Organic Chem., BSc Inorganic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the catalytic application of transition metal complexes in organic synthesis, the relevant reaction mechanisms and the structural background behind the catalytic effects.

Course contents
General questions of the activation of small molecules (H_2 , HCN, $HSiR_3$, CO, CO_2 , O_2). Oxidative addition, reductive elimination; the 18-electron rule. Catalyst recycling. Immobilized complex catalysts, biphasic reactions, complex catalyzed synthesis with phase-transfer catalysis. Regio-, stereo-, and enantioselective catalysis. Hydrogenation, hydrocyanation, hydrosilylation of olefins, ketones and nitro compounds. Reductive amination. Dehydrogenation. Reduction with hydrogen transfer. Hydrogenolysis of C-X bonds (X: oxygen, halogen). Hydroformylation, carbonylation and decarbonylation. Catalytic methods of C-C bond formation. Olefin metathesis. Oxidation. Selected syntheses of biologically active compounds.

Recommended reading
1. Faigl F., Kollár L., Kotschy A., Szepes L.: Szerves fémvegyületek kémiája, Nemzeti Tankönyvkiadó, Budapest, 2001.
2. J.P. Collman, L.S. Hegedus, J.R. Norton, R.G. Finke: *Principles and Applications of Organotransition Metal Chemistry,* University Science Books, Mill Valley, CA, 1987
3. B. Cornils, W.A. Herrmann: *Applied Homogeneous Catalysis with Organometallic Compounds*, Wiley-VCH, Weinheim, 1996
4. P.W.N.M. van Leeuwen: *Homogeneous Catalysis. Understandig the Art*, Kluwer, Dordrecht, 2004.

Teaching methods
This is a course based on oral lectures backed by multimedia teaching techniques. Although there are no formal prerequisites, the course requires the basic knowledge of inorganic, structural, organometallic and organic chemistry (provided by BSc training).

Assessment methods
Assessment is carried out at the end of the semester. Students are required to prepare a short review of a given topic -related to the course contents- based on there own literature search. Topics are selected after screening the relevant articles in Chemical and Engineering News of the preceeding year. These reviews can be submitted throughout the examination session. They are corrected and commented by the lecturer and the results are discussed with the students.

Course title:	**Environmental Chemistry**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Kathó, Ágnes**
Prerequisites:	**Theoretical Physical Chem. (co-requisite)**
Language of instruction:	**Hungarian or English**

Objective of the course
To present chemical processes and interactions important in the environment.

Course contents
Definition, principles, special research methods of environmental chemistry, and its connection with economy and other branches of science. Evolution of the environment from nucleogenesis to the foundation of the biosphere. Composition and basic chemical processes of the atmosphere, hydrosphere and pedosphere.

Recommended reading
1. Papp Sándor, Rolf Kümmer: Környezeti kémia, *Tankönyvkiadó, Budapest, 1992*.
2. Papp Sándor: Biogeokémia, *Veszprémi Egyetemi Kiadó, Veszprém, 2002*.
3. Gary W. vanLoon, Stephen J. Duffy: Enviromental Chemistry, *Oxford University Press, Oxford, New York, 2005*.

Teaching methods
This is a lecture with no prerequisites, however, it relies on knowledge obtained in previous courses of inorganic, organic, nuclear, and physical chemistry. The lecture uses multimedia teaching techniques together with demonstrations.

Assessment methods
Assessment is carried out with written examinations at the end of the semester. Examination papers are corrected by the lecturer with no second examiner; however, marking is discussed with the students. Questions of the examination are selected from a list of problems/questions known prior to the students. Examination time is 60 min.There is no comprehensive examination.

Course title:	**Modern Infrared Spectroscopy**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Nagy, István**
Prerequisites:	**BSc Analytical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To overview the physical chemical background of infrared spectroscopy and its applications.

Course contents
Vibrational spectra, characteristic group frequencies. Physical optics in the infrared wavelength range. Materials applied in infrared spectroscopy, structure and operation of infrared spectrometers. Interferogam, spectrum, Fourier-transformation for data processing. Characteristics of infrared spectra, factors influencing spectra in classical IR spectroscopy. Sample treatment, solvent and concentration effects, polymorphism, spectral artifacts.
Reflection spectroscopy: total reflectance, total internal reflectance. Principles, practice, examples of application. Principles, practice, and application of Attenuated Total Reflectance (ATR) spectroscopy. HATR, UATR. Principles, practice, and application of Internal diffuse reflectance spectroscopy.
Infrared microspectroscopy. Quantitative methods in solution-phase infrared spectroscopy. „In situ" solution spectroscopy – extension of the application possibilities of infrared spectroscopy in reaction kinetics. Processing and evaluation of spectra. Spectrum databases: generation, standardization, searching. Identification of unknown materials: information from spectra and auxiliary investigation by other analytical techniques. Infrared spectroscopy in quality assurance. Practical examples of the use of modern infrared spectroscopic methods in industrial and forensic analysis.

Recommended reading
1. *Encyclopedia of Spectroscopy and Spectrometry*, Eds. G. Tranter, J. Holmes, J. Lindon
2. A. Smith: *Applied Infrared Spectroscopy*

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral exam, or problem solution based on lecture material.

Course title:	**X-Ray Diffraction**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Bényei, Attila**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the theoretical and practical background of using X-ray diffraction methods for chemical structure determination.

Course contents
X-ray radiation and its practical applications. Principles of diffraction methods. Single crystal X-ray diffraction compared with other methods of structure determination. Fourier transformation and its characteristics. The least squares method of refinement. Symmetry. Properties of solids, crystals: single crystals, crystal lattice, unit cell, Miller indexes, symmetry symbols, space groups, crystallographic notation of symmetry elements, systematic absences, reciprocal lattice. Single crystal growing. Development of X-ray methods, types of detectors, photographic methods. Powder diffraction. Four-circle single crystal diffractometers, area detectors, CCD camera. Steps in X-ray diffraction structural determination. Determination of the symmetry and the size of the unit cell, data collection, data/parameter ratio, solution and refinement. Determination of absolute configuration by X-ray diffraction. Principles of direct methods and the limtations of their use. Patterson map, heavy atom methods. Models and reality. Publication of X-ray diffraction results, electronic publication, CIF. Results, characteristic bond angles and bond lengths. Disordered structures, probability-based structure determination. Thermal motion of atoms, ORTEP. Software resources in structure solution: Xtal, WinGX, SIR, ShelX, Crystal. Crystallographic databases, CSD. Polymorphism. Basics of protein crystallography.

Recommended reading
1. J. M. Schultz: Az anyagvizsgálat diffrakciós módszerei, Műszaki Könyvkiadó, Budapest, 1987
2. W. Massa: Crystal Structure Determination, Springer, 2000
3. G. H. Stout, L. H. Jensen: Crystal structure determination, John Wiley, 1989
4. Local handouts and internet, www.iucr.org

Teaching methods:
Beside conventional lectures project works and self learning of basics of softwares.

Assessment methods:
Pre-exam: demonstration of the knowledge to use the CSD database. Oral exam or optionally written project work of 20-30 pages in a choosen topic.

Course title:	**Introduction to Nonlinear Chemical Dynamics**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Gáspár Vilmos, Rábai Gyula**
Prerequisites:	**BSc Physical Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students into the theory of nonlinear chemical processes.

Course contents
A historical overview of nonlinear chemical dynamics.
Linear stability in univariate systems. Reaction of iodate with arsenious acid. Combustion. Phase diagram. Bistablity, hysteresis, stable and unstable stationary points.
Linear stability in bivariate systems. Stable and instable nodes, focus and saddle points. Activator, inhibitor. Saddle node and Hopf bifurcation. oscillations. Poincaré–Bendixson theory.
Oscillation reactions: classification and characteristics. The Belousov-Zhabotinsky reaction, excitability. Field-Kőrös-Noyes mechanism. Oregonator model.
Systematic design of oscillation reactions. The chlorite iodide reaction. pH oscillators.
Deterministic chaos and its properties. Poincaré-plane. Strange attractors, logistic function. Chaos control.
Simple autocatalytic fronts. Chemical waves. Dispersion curve, critical size. Gunplate pattern and spiral waves.
Other spatial and temporal pattern. Patterns induced by differences in diffusion. Turing patterns. Self-reproducing patterns.
Pattern formation in biological systems.

Recommended reading
1. Epstein, I. R.; Pojman, J. *An Introduction to Nonlinear Chemical Dynamics*, Oscillations, Waves, Patterns and Chaos; Oxford: N.Y., 1998

Teaching methods
Multimedia teaching techniques.

Assessment methods
Written or oral exam, or problem solution based on lecture material.

Course title:	**Secondary Natural Compounds I.**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Berényi, Sándor**
Prerequisites:	**BSc Organic Chem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To introduce students into the chemistry of secondary metabolites.

Course contents
Secondary metabolites in biochemical processes. Biosynthesis of aliphatic and aromatic compounds. Chemical reaction classes of biosynthetic processes: group transfer, cyclization, rearrangement. Classification, biosynthesis, biological synthesis, biological effects and practical applications of alkaloids and isoprene-based compounds (terpenes, carotinoids and steroids).

Recommended reading
1. Bruckner Győző: Szerves Kémia II/2., III/2., Tankönyvkiadó, Budapest
2. Tóth László: Gyógynövény és drogismeret, Egyetemi Kiadó, Debrecen
3. J. D. Bulock: The Biosynthesis of Natural Products - an Introduction to Secondary Metabolites, McGraw-Hill, London, 1965.

Teaching methods
Tutorial system. Multimedia teaching techniques.

Assessment methods
Written examination, time allocated is minimum 30, maximum 60 minutes. Evaluation is the individual responsibility of the teacher.

Course title:	**Secondary Natural Compounds II.**
Course code:	**TKML....**
Type of course:	**laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**2 through 4**
Number of credits:	**3**
Name of lecturer:	**Berényi, Sándor**
Prerequisites:	**Secondary Natural Compounds I.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide students with experience in the isolation and modification of natural compounds.

Course contents
Determination of active compounds in natural materials with thin layer chromatography. Separation of natural compounds by column chromatography. Isolation of alkaloids, terpenes, and flavonoids by extraction or steam distillation. Synthesis and chemical modification of natural compounds.

Recommended reading
1. Berényi S.; Patonay T.: Szerves Kémiai Laboratóriumi Gyakorlatok (gyógyszerészhallgatók számára). Kossuth Egyetemi Kiadó Debrecen, 1999.
2. R. Ikan: Natural Products - A Laboratory Guide, Academic, San Diego, 1991.
3. Tóth L.: Gyógynövény és drogismeret, DE,

Teaching methods
Laboratory practice on individual problems.

Assessment methods
Written test – before laboratory work. Oral test – after laboratory work.

Course title:	**Chiroptical Spectroscopy**
Course code:	**TKME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Kurtán, Tibor**
Prerequisites:	**Methods of Structure Determination**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the connection between molecular structure and optical properties, and the use of chiroptical methods in the determination of absolute configuration and conformation.

Course contents
Fundamentals of group theory. Theory of optical rotation dispersion (ORD) and circular dichroism (CD) spectroscopy. Empirical chiroptical rules for different chromophore systems. Interpretation of the sign of chiroptical properties connected to the optical activity and stereochemistry of molecules based on the Snatzke's qualitative MO method.

Recommended reading
1. Antus S., Mátyus P.: Szerves Kémia I., Nemzeti Tankönyvkiadó, Budapest, 2005, 82-92. oldal
2. Kovács I., Szőke J.: Molekulaspektroszkópia, Akadémiai Kiadó, Budapest, 1987, 442-522. oldal
3. E. L. Eliel, S. H. Wilen: Stereochemisty of Organic Compounds. Wiley, New York, 1994.
4. N. Berova, K. Nakanishi, R.W. Woody: Circular Dichroism, Wiley, New York, 2000.

Teaching methods
Interactive lectures for a small group of students aided by powerpoint slides. Hand-outs are provided for problem-solving from up-to-date research topics.

Assessment methods
Oral examinations are carried out at the end of each semester but half an hour is provided for writing a draft in the selected topic. Comprehensive exam is not planned at the end of the lecture series. It is only the lecturer who is involved as examiner.

Course title:	**Enzyme Technology**
Course code:	**TBME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Barna, Terézia**
Prerequisites:	**BSc Biochem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To present the properties and practical uses of enzymes.

Course contents
Structure and structural levels of proteins. Stability, dynamics and folding of peptides. Fundamentals of enzyme action: specificity and catalytic efficiency. Classification f enzymes. Enzyme kinetics and regulation. Molecular mechanism of the catalytic activity of enzymes. Isolation and production of enzymes. Enhancement of enzyme properties with protein engineering, natural and *in vitro* evolution. Enzyme immobilization. Enzymes as biocatalysts: enzymes in organic synthesis. Industrial uses of enzymes: examples form food and pharmaceutical industries.

Recommended reading
1. Keleti Tamás: Enzimtechnika, Tankönyvkiadó
2. R.K. Scopes: Protein purification, Springer-Verlag, Berlin, 1994.
3. W. Hartmeier: Immobilized Biocatalysts, Springer-Verlag, Berlin, 1986.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Biochemistry II.**
Course code:	**TBML....**
Type of course:	**laboratory practice**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Gyémánt, Gyöngyi**
Prerequisites:	**BSc Biochem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide practical skills in biochemistry especially in enzymology and in characterization of biomolecules.

Course contents
Enzymes and mechanisms of enzyme action. Stability of enzymes, the influence of the reaction conditions on enzymatic activity. The Michaelis-Menten model for the kinetic properties of enzymes. Definition, significance and determination of K_M and v_{max}. Specific inhibition of enzymes and determination of the type of inhibition. Regulation of enzymes with allosteric interaction or covalent modification.
Preparation, activity measurement and kinetic investigation of some oxidoreductases and hydrolases.

Recommended reading
1. Ádám Veronika. Orvosi biokémia, (Medicina Könyvkiadó, 2002. ISBN 963 242 967 X
2. J. M. Berg, J. L. Tymoczko, L. Stryer: Biochemistry V. edition (W. H. Freeman and Co. 2002. ISBN 0-7167-4684-0)
3. Keleti Tamás: Enzimkinetika,
4. A. Cornish-Bowden: Fundamentals of enzyme kinetics, (Portland Press, 2002, ISBN 1 85578 072 0)
5. Kandra Lili: Biokémiai gyakorlatok. Egyetemi jegyzet. 4. kiadás (Kossuth Egyetemi Kiadó, 2002)

Teaching methods
Teaching in practical courses. Multimedia teaching techniques. Teamwork as an element of teaching.

Assessment methods
Grading based on short weekly tests and reports prepared by the students.

Course title:	**Biochemistry III.**
Course code:	**TBME....**
Type of course:	**lecture**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**1 through 4**
Number of credits:	**3**
Name of lecturer:	**Harangi, János**
Prerequisites:	**BSc Biochem.**
Language of instruction:	**Hungarian or English**

Objective of the course
To provide deep knowledge in biochemistry especially in human organization, metabolism, regulation of enzymes, integration of metabolism and molecular immunology.

Course contents
Protein conformation, dynamics and function. Oxygen-transporting proteins, molecular pathology of hemoglobin. Blood clotting cascade. Proteins of immuno protection system: immunoglobulins. Proteins of mechanical support and coordinated motion: collagen, miozin. Structure and function of biological membranes. Glycoproteines, lipoproteines. Membrane transport system. Enzymes and mechanisms of enzyme regulation. Synthesis of membrane lipids and steroid hormones. Metabolism of amino acids and nitrogen containing biomolecules. Viruses and oncogenes. Hormone action.

Recommended reading
1. Ádám Veronika. Orvosi biokémia, (Medicina Könyvkiadó, 2002. ISBN 963 242 967 X
2. J. M. Berg, J. L. Tymoczko, L. Stryer: Biochemistry V. edition (W. H. Freeman and Co. 2002. ISBN 0-7167-4684-0).
3. Boross l., Sajgó M., A biokémia alapjai, Mezőgazda Kiadó, 2004.

Teaching methods
Multimedia teaching techniques.

Assessment methods
Oral or written examination at the end of the semester.

Course title:	**Professional Communication in English**
Course code:	**.....**
Type of course:	**language class**
Level of course:	**elective**
Year of study:	**1-2**
Semester:	**2 through 4**
Number of credits:	**3**
Name of lecturer:	**Szekeres-Semsei, Edit**
Prerequisites:	**State-recognized language exam, intermediate level**
Language of instruction:	**English**

Objective of the course
To develop oral and written communication skills in English necessary understand modern chemical literature, listening to and giving oral presentations.

Course contents
Competence-based, grammar-oriented general language skill development with special emphasis on written and oral chemical texts. Grammar and semantics for chemistry-related texts, and their recognition and use in producing texts. Oral presentation based on the students' individual professional interests and preparation of the written abstract of a chemical lecture.

Recommended reading
1. Klaudy Kinga: A fordítás elmélete és gyakorlata, 3rd ed., Scholastica, Budapest, 1997

Teaching methods
Language classses in small groups.

Assessment methods
Based on mid-term tests and a take-home sample translation.

Part 2

Teaching staff information

Numbers of the academic staff (teaching staff) involved in delivering the study programme of student enrolment

Academic staff:	51
Full professors:	16
Associate professors:	14
Assistant professors:	9
Teaching assistants:	12
Student enrolment:	~60/year (capacity 100)

Faculty member CVs

Antus, Sándor

Full Professor
Department of Organic Chemistry

Date and place of birth: February 28, 1944 Szeged, Hungary

Education an positions
1963-1968 Studied chemistry at Technical University of Budapest (TU) and graduated in 1968
1968-1971 PhD (in Chemistry) at Department of Organic Chemistry of TU
1972-1977 Research fellow at Central Research Institute of Hungarian Academy of Sciences
1978-1992 Senior research fellow in the Research Group for Alkaloid Chemistry of H.A.S.
1987 Associate Professor at Dept. Org. Chem. of TU
1992- Head of Dept. Org. Chem. of University of Debrecen
2002- Vice-Dean at the Faculty of Sciences of the University of Debrecen

Postdoctoral fellowships:
1977/1982 Prof. Dr. G. Snatzke, Lehrstuhl für Structurchemie der Ruhr-Universität Buchum
1979/1983 Prof. Dr. H. Wagner, Institute für Pharmazeutische Biologie der Universität München
1987 Prof. Dr. E. Zbiral, Dept. Org. Chem. of University Vienna
1988 Prof. Dr. A. Dreiding, Dept. Org. Chem. of University Zürich

Honours and awards:
1984 Géza Zemplén Prize (Hung. Acad. Sci.)
2000 Széchenyi-Prize (President of Hungarian Republic)
1997-2001 Széchenyi Professorial Fellowship

Publications in 2005-2007:
Eur. J. Org. Chem. **2007**, 4845.
Eur. J. Pharm. Sci. **2007**, *32*, S32.
Eur. J. Org. Chem. **2007**, 3206.
Rap. Comm. Mass Spectrom. **2007**, *21*, 2255.
Chirality **2007**, 464.
Bioorg. Med. Chem., **2007**, *15*, 4048.
Tetrahedron-Asymm. **2007**, 18, 925.
Langmuir **2007**, *23*, 5283.
Eur. J. Org. Chem. **2007**, 1123.
Eur. J. Org. Chem. **2007**, 296.
Nat. Prod. Comm. **2006**, *1*, 991.
Nat. Prod. Comm. **2006**, *1*, 51.
Eur. J. Org. Chem. **2006**, 3498.
Phytomed. **2006**, *13*, 85.
Heterocyc. Comm. **2005**, *11*, 491.
Eur. J. Org. Chem. **2005**,4563.
Heterocyc. Comm. **2005**, *11*, 403.
Eur. J. Org. Chem. **2005**, 4061.
Chem. Biodiv. **2005**, *2*, 799.
J. Pharmacol.Exp. Ther. **2005**, *314*, 346.
In Vivo **2005**, 19, 367.
In Vivo **2005**, 19, 433.

Bányai, István
Full Professor
Department of Colloid and Environmental Chemistry

Year of birth: 1953

Education

1959-67 primary school Debrecen, Hungary
1967-71 secondary high school degree: chemical technician (highest grade)
1972-77 university studies at Lajos Kossuth University, Debrecen
degree: chemist with distinguished diploma
1986 degree: candidate of chemistry sciences (Hungarian Academy of Sciences)
1987 degree: doctor of Lajos Kossuth University
2003 degree: doctor of chemistry sciences (Hungarian Academy of Sciences)

Academic positions

1987 – 1992 Assistant Professor at Lajos Kossuth University Debrecen
1992 – 2005 Associate Professor at Lajos Kossuth University Debrecen
2005 - 2006 Professor of Physical Chemistry at University of Debrecen
2006 - ….. Professor of Colloid and Environmental Chemistry at University of Debrecen

Postdoctoral Training

1987-88 postdoctoral fellow at Department of Inorganic Chemistry, The Royal Institute Technology, Stockholm Sweden
1992-93 postdoctoral fellow at Department of Inorganic Chemistry, The Royal Institute Technology, Stockholm Sweden
1997-98 senior research fellow at Department of Inorganic Chemistry, The Royal Institute Technology, Stockholm Sweden: Complexes of uranium in aqueous solution
2003 senior research fellow at Department Bio-nano Technology, University of Michigan, Ann Arbor, USA: Preparation of inorganic nano particles
2007 visiting professor Department of Radiation Medicine, Roswell Park Cancer Institute, Buffalo, USA

Honors and Awards

1998-2002 Distinguished Professor by name Istvan Szechenyi
2002-2005 Special Professorship awarded by Ministry of Education

Publications in 2005-2007:

Zs. Baranyai, I. Bányai, E. Brücher, R. Király, E. Terreno *Eur. J. Inorg. Chem.* **2007**, 3639.
L. Novák, I.Bányai, J. E. Fleischer-Radu, J. Borbély *Biomacromolecules* **2007** 1624.
Jászberényi, Z., Bányai, I., Brücher, E., Király, R., Hideg, K., Kálai, T. *Dalton Trans.* **2006** 1082.
Shi XY, Banyai I, Rodriguez K, Islam MT, Lesniak W, Balogh P, Balogh LP, Baker JR *Electrophoresis* **2006**, *27*, 1758.
Shi XY, Bányai I, Lesniak WG, Islam MT, Orszagh I, Balogh P, Baker JR, Balogh LP *Electrophoresis* **2005**, *26*, 2949.
Sz. Vass, H.Grimm, I. Bányai, G. Meyer, T. Gilányi *J. Phys. Chem. B* **2005**, *109,* 11870.
Csajbok E, Banyai I, Vander Elst L, Muller RN, Zhou WZ, Peters JA *Chem. Eur. J.* **2005**, *11* 4799.
X.Y. Shi, I. Bányai, M.T. Islam, W. Lesniak, D. D. Davis, J. R. Baker Jr., L. P. Balogh *Polymer* **2005**, *46*, 3022.

Barna, Terézia Mária
Assistant Professor
Department of Biochemistry

Year of birth: 1963

Education and academic degrees

1986 M.Sc. in chemistry
1986 M.Sc. in biotechnology
2006 PhD in biology

Publications in 2005-2007:

J. Invest. Med. **2007**, *55*, S356.
FEBS J. **2005**, *272*, 4660.

Beke, Dezső
Full Professor
Department of Solid State Physics

Year of birth: 1945

Education and academic degrees

1969 M.Sc. in physics
1982 C.Sc. degree
1992 D.Sc. degree

Awards

1998-2001 Széchenyi Professorial Fellowship

Publications in 2005-2007:

J. Optoelectron. Adv. M. **2007**, *9*, 2063.
Vacuum **2007**, *82*, 257.
Acta Mat. **2007**, *55*, 1823.
Mat. Sci. Eng. A-Struct. **2006**, *438*, 80.
Apll. Surf. Sci. **2006**, *253*, 1160.
Mat. Sci. Forum **2006**, *517*, 153.
J. Noncrystal. Solid. **2006**, *352*, 1591.
Def. Diff. Forum **2006**, *249*, 119.
Mater. Trans. **2006**, *47*, 631.
Phys. Rev. B **2006**, *731*, Art. No. 035426.
Materialwiss. Werkst. **2005**, *36*, 509.
Vacuum **2005**, *80*, 87.
Vacuum **2005**, *80*, 168.
J. Phase Equilib. Diff. **2005**, *26*, 423.
J. Optoelectron. Adv. M. **2005**, *7*, 1831.
Def. Diff. Forum **2005**, *237-240*, 537.
Def. Diff. Forum **2005**, *237-240*, 543.
Def. Diff. Forum **2005**, *237-240*, 727.
Def. Diff. Forum **2005**, *237-240*, 1031.
Def. Diff. Forum **2005**, *237-240*, 1216.
Def. Diff. Forum **2005**, *237-240*, 1246.
Mater. Trans. **2005**, *46*, 978.
Phys. Rev. B **2005**, *71*, Art. No. 115432.
Mat. Sci. Forum **2005**, *473-474*, 459.
Mat. Sci. Forum **2005**, *473-474*, 477.

Bényei, Attila Csaba

Associate Professor
Department of Physical Chemistry

Year of birth: 1962

Education and training:
1981-1986 Kossuth Lajos University, Debrecen, Hungary (now University of Debrecen), MSc. with honors, majors in Chemistry and English. 1986-1989, Postgraduate studies at the Department of Physical Chemistry, TMB fellowship from the Hungarian Academy of Sciences,
1990, Ph.D., Kossuth Lajos University, Debrecen, Hungary. Thesis: Complex Catalyzed Hydrogenation and Hydrogen Transfer Reactions of Lipophilic Substrates in Aqueous Media, Advisor: Prof. Ferenc Joó.

Publications:
55 publications in international journals, participation in 25 international conferences.

Postdoctoral research:
2007, 1997 and 1993, Texas A&M University, visiting scientist (Prof. D.J. Darensbourg), 2006 and 1996 Ursity of St Andrews (Scotland, Dr. P. Lightfoot), 1996 University of Rennes (France, Prof. Pierre Dixneuf), 1990-91, University of Ottawa, (Prof. H. Alper)

Awards:
Michael Polanyi Award from the Hungarian Academy of Sciences, 1997.

Memberships:
European Crystallographic Association, Hungarian Chemical Society, Michael Polanyi Liberal Philosophical Association.

Publications in 2005-2007:
1. Tircso, Gy.; Benyei, A. C.; Kiraly, R.; Lazar, I.; Pal, R.; Brücher, E. *Eur. J. Inorg. Chem.* **2007**, 701.
2. Bostai, B.; Novak, Z.; Benyei, A. C.; Kotschy, A. *Organic Letters* **2007**, *9*, 3437.
3. Majer, G.; Borbas, A.; Illyes, T. Z.; Szilagyi, L.; Benyei, A. C.; Liptak, A. *Carbohyd. Res.* **2007**, *342*, 1393.
4. Balogh, J.; Zsoldos-Mady, V.; Frigyes, D.; Benyei, A. C.; Skoda-Földes, R.; Sohar, P. *J. Organomet. Chem.* **2007**, *692*, 1614.
5. Benyei, A. C.; Gulyas, H.; Ozawa, Y.; Kimura, K.; Toriumi, K.; Kegl, T.; Bakos, J. *J. Organomet. Chem.* **2007**, *692*, 1845.
6. Brito, I.; Lopez-Rodriguez, M.; Benyei, A.C.; Szilagyi, L. *Carbohyd. Res.* **2006**, *341*, 2967.
7. Tircso, Gy. Benyei, A. C., Brücher, E.; Kis, A.; Kiraly, R. *Inorg. Chem.* **2006**, *45*, 4951.
8. Kuik, A.; Skoda-Földes, R.; Benyei, A. C.; Rangits, G.; Kollar, L. *J. Organomet. Chem.* **2006**, *691*, 3037.
9. Paczal, A.; Benyei, A. C.; Kotschy, A. J. Org. Chem. **2006**, *71*, 5969.
10. Koshino, N.; Usui, S.; Iwai, Y.; Varga, T. R.; Chowdhury, S.; Benyei, A. C.; Iwamura, M.; Ikeda, Y. *J. Nucl. Radiochem. Sci.* **2005**, 6, 161.
11. Joszai, R.; Beszeda, I.; Benyei, A. C.; Fischer, A.; Kovacs, M.; Maliarik, M.; Nagy, P.; Shchukarev, A.; Toth, I. *Inorg. Chem.* **2005**, *44*, 9643.

Berényi, Sándor
Associate Professor
Department of Organic Chemistry

Place and date of birth: Debrecen (Hungary) Jan. 08. 1947.
Marital status: Married, 3 children

Education and degrees:

chemistry and physics, L. Kossuth University, Debrecen, Hungary, 1971.
University Doctor, (L. Kossuth University), 1975.
C.Sc. (PhD). Hungarian Academy of Sciences, 1987.
Habilitation: University of Debrecen 1997.

Positions:

1971- Research fellow (Alkaloida Chemical Factory, Tiszavasvári)
1976- Research associate (Research Group of Hungarian Academy of Sciences)
1989- Assistant professor (L. Kossuth University, Debrecen)
1991- Associate professor (University of Debrecen)

Research activity:

Chemistry of the morphine alkaloids
Synthesis of new morphinanedienes
Chemical transformation of thebaine and other morphinanedienes to aporphines
Cycloaddition reaction of morphinanedienes

Award:

Széchenyi fellowship from the Ministry of Education, Hungary, 2001-2004

Memberships:

Working Committee of Research for Alkaloids (Hungarian Academy of Sciences)
Working Committee of Research for Plant chemistry (Hung. Academy of Sciences)

Education activity:

Organic Chemistry-I (GYKSZ01G2), Organic Chemistry-II (GYKSZ03G3), Chemistry of Natural Products (T K3461), Natural Products Laboratory (T K3462), Organic Laboratory-II (T K2404), Chemistry of Alkaloids (T PK6102)

Publications in 2005-2007:

Pifl, C.; Nagy, G.; Berényi, S.; Kattinger, A.; Reither, H. and Antus, S. *J. Pharmacol. Exp. Ther.* **2005,** *314,* 346-354.
Tóth, M.; Berényi, S.; Csutorás, Cs.; Kula, N. S.; Zhang, K.; Baldessarini, R. J. and Neumeyer, J. L. *Bioorg. Med. Chem.* **2006,** *14,* 1918-1923.
Berényi, S.; Sipos, A.; Szabó, I. and Kálai, T. *Synth. Commun.* **2007**, *37*, 467-471.
Berényi, S.; Csutorás, Cs.; Sípos, A. and Gyulai, Zs. *Lett. Org. Chem.* **2007,** *4,* 32-34.
Sipos, A.; Debreceni, Sz.; Szabó, R.; Gyulai, Zs.; Berényi, S. *Synth. Commun.* **2007**, *37*, 2549-2558.
Sípos, A. and Berényi, S. *Lett. Org. Chem.* **2007,** *4,* 146-150.
Csutorás, Cs.; Berényi, S.; Neumeyer, J.L. *Lett. Org. Chem*., **2007**. *4,* 409-413.
Sipos, A.; Girán, L.; Mittendorfer, H.; Schmidhammer, H. and Berényi, S. *Tetrahedron* **2007**, doi: 10.1016/j.tet.2007.08.075.
Tóth, M.; Gyulai, Zs.; Berényi, S. and Sipos, A. *Lett. Org. Chem*., **2007**. *4.*

Berka, Márta
Assistant Professor
Department of Colloid and Environmental Chemistry

Birth date: 1949

Education:

1968-1973	university studies at Lajos Kossuth University, Debrecen; degree: chemist
1984	degree of university doctor (summa cum laude**,** equivalent with Ph.D.)
2007	habilitation**,** University of Debrecen

Academic positions:

1973 assistant lecturer, Department of Physical Chemistry, Lajos Kossuth University
1979 – 1984 assistant lecturer, Isotope Laboratory, Lajos Kossuth University
1984 – assistant professor, Department of Colloid Chemistry at University of Debrecen

Publications in 2005-2007:

Balogh L.P., Minc L.D., Berka M., Pla S. P. and Rice J. A. *Langmuir* 22 (1), 687 (***2006***)
Banyai I., Berka M., Orszagh I., Balogh L. P. *Polymer Preprint* 46 (2), 519 (***2005***)
Berka M, Rice J. A. *Langmuir* 21 (4): 1223 (***2005***)

Braun, Mihály
Assistant Professor
Department of Inorganic and Analytical Chemistry

Year of birth: 1966

Education and academic degrees

1991 M.Sc. in biology
1994 specialized degree in instrumental analysis
1998 Ph.D. in chemistry

Awards

1991 Pro Scientia award
2001-2004 Bolyai János research fellowship

Publications in 2005-2007:

J. Paleolimnology **2006**, 36, 1.
Anyagvizsgálók Lapja **2005**, *15*, 61.
Magy. Kém. Foly. **2005**, *111*, 38.
Anyagvizsgálók Lapja **2005**, *15*, 127.
Anyagvizsgálók Lapja 2007, 17, 27-35.

Brücher, Ernő
Professor Emeritus
Department of Inorganic and Analytical Chemistry

Year of birth: 1936

Education and academic degrees

1958 M.Sc. in chemistry
1965 Ph.D. in chemistry
1969 C.Sc. degree
1982 D.Sc degree

Awards

1994 Szent-Györgyi Albert Award
2007 Hatvani Award of the town of Debrecen for outstanding achievements

Publications in 2005-2007:

Eur. J. Inorg. Chem. **2007**, 4340.
Eur. J. Inorg. Chem. **2007**, 3639.
Inorg. Chem. **2007**, *46*, 5260.
Contrast Media and Mol. Imag., **2007**, *2*, 94.
Eur. J. Inorg. Chem. **2007**, 701.
Inorg. Chem. **2007**, *45*, 4951.
Eur. J. Inorg. Chem. **2006**, 1976.
Dalton Trans. **2006**, 1082.
Helv. Chim. Acta **2005**, *88*, 604.
Helv. Chim. Acta **2005**, *88*, 633.
Dalton Trans. **2005**, 694.

Buglyó, Péter
Associate Professor
Department of Inorganic and Analytical Chemistry

Year of birth: 1965

Education and academic degrees

1989 M.Sc. in csemistry
1993 Ph.D. in chemistry
1996 special degree in German-Hungarian chemical translation
2004 habilitation

Awards

1999-2002 Bolyai János research fellowship
2003-2006 Bolyai János research fellowship

Publications in 2005-2007:

J. Pharm. Biomed. Anal. **2007**, *44*, 1040.
J. Phys.. Chem. A **2007**, *111*, 7736.
Polyhedron **2007**, *26*, 1625.
Polyhedron **2007**, *26*, 543.
Pure Appl. Chem. **2005**, *77*, 1583.
Inorg. Chem. **2005**, 44, 5416.
Polyhedron **2005**, *24*, 837.

Daróczi, Lajos
Assistant Professor
Department of Solid State Physics

Year of birth: 1965

Education and academic degrees
1989 M.Sc. in physics
1997 Ph.D. in physics

Publications in 2005-2007:
J. Optoelectron. Adv. M. **2007**, *9*, 2063.
Acta Mat. **2007**, *55*, 1823.
J. Noncrystal. Solid. **2007**, *353*, 1478.
J. Radioanal. Nucl. Chem. **2006**, *267*, 297.
Mat. Sci. Eng. A-Struct. **2006**, *438*, 80.
J. Optoelectron. Adv. M. **2005**, *7*, 963.
Nucl. Instr. Meth. Phys. Res. B. **2005**, *229*, 240.
Mat. Sci. Forum **2005**, *473-474*, 103.
Vacuum **2005**, *80*, 168.
Def. Diff. Forum **2005**, *237-240*, 1246.
Mater. Trans. **2005**, *46*, 978.
Mat. Sci. Forum **2005**, *473-474*, 477.

Deák, György
Associate Professor
Department of Applied Chemistry

Year of birth: 1954

Education and academic degrees

1978 M.Sc. in chemistry
1997 Ph.D. in chemistry

Awards

2001-2004 Békéssy György postdoctoral fellowship

Publications in 2005-2007:

J. Pharmacol. Sci. **2007**, *105*, 279.
Carbohyd. Res. **2007**, *342*, 1323.
J. Am. Soc. Mass. Spectrom. **2006**, *17*, 962.
Carbohyd. Plym. **2006**, *63*, 136.
Eur. Polym. J. **2005**, *41*, 1478.
Rap. Comm. Mass. Spectrom. **2005**, *19*, 1263.
Macrmol. **2005**, *38*, 4043.
J. Am. Soc. Mass. Spectrom. **2005**, *16*, 152.

Erdélyi, Gábor
Associate Professor
Department of Solid State Physics

Year of birth: 1950

Education and academic degrees

1974 M.Sc. in physics
1993 C.Sc. degree
2004 habilitation

Awards

2001-2004 Széchenyi István fellowship

Publications in 2005-2007:

Vacuum **2007**, *82*, 257.
ACM Comput. Surv. **2007**, *39*, Art. No. 6.
Intermetal. **2007**, *15*, 1078.
J. Noncrystal. Solid. **2006**, *352*, 1591.
Vacuum **2005**, *80*, 168.
Def. Diff. Forum **2005**, *237-240*, 543.
Def. Diff. Forum **2005**, *237-240*, 1246.

Fábián, István

Full Professor
Department of Inorganic and Analytical Chemistry

Date and place of birth: June 4 1956, Debrecen, Hungary

Education and academic degrees

1980 M.Sc. in chemistry Lajos Kossuth University
1982 Ph.D. in chemistry Lajos Kossuth University
1991 C.Sc. in chemistry Hungarian Academy of Sciences
1998 Dr. habil. Lajos Kossuth University
2002 D.Sc. Hungarian Academy of Sciences

Positions

1980 - 1982 Doctoral Fellow, Lajos Kossuth University, Debrecen, Hungary
1982 - 1986 Research Associate, Lajos Kossuth University, Debrecen, Hungary
1983 - 1984 Postdoctoral Fellow, Max-Planck-Institut für Biophysicalische Chemie, Göttingen, Germany
1986 - 1994 Assistant Professor, Lajos Kossuth University, Debrecen, Hungary
1988 - 1991 Visiting Research Professor, Department of Chemistry, Miami University, Oxford, Ohio,U.S.A .
1992 - 1993 Alexander von Humboldt Fellow, Institut für Anorganische Chemie, Universität Witten/Herdecke, Witten, Germany
1994 - 2003 Associate Professor, University of Debrecen, Debrecen, Hungary
2003 - Full Professor, University of Debrecen, Debrecen, Hungary

Membership in Professional organizations

1980 - Hungarian Chemical Society, 1993 - Hungarian Association of Humboldtians, 1998 - International Ozone Association, 1998 - Editorial Board of the journal Inorganic Reaction Mechanisms, 2001 - American Chemical Society

Awards

1992 - 1993 Alexander von Humboldt Fellow
1998 - 2001 Széchenyi Professor
2001 - 2002 Széchenyi István Award

Publications in 2005-2007:

Dalton Transactions, **2007**, 4268-4275.
New Journal of Chemistry, **2007**, *31*, 1707-1707.
Journal of the American Chemical Society, **2007**, *129*, 7738-7739.
Inorganic Chemistry, **2007**, *46*, 4230-4238.
Pure Appl. Chem. **2006**, 78, 1559.
Dalton Transactions, **2006**, 955-960.
New Journal of Chemistry, **2005**, *29*, 759-760.
Journal of the American Chemical Society, **2005**, *127*, 4785-4793.
J. Mol. Liq. **2005**, *118*, 195.

Farkas, Etelka
Full Professor
Department of Inorganic and Analytical Chemistry

Date and place of birth: September 13, 1948, Erdőbénye, Hungary

Education (degrees, dates, universities):

M.Sc in Chemistry,	1972,	Lajos Kossuth University, Debrecen, Hungary
Cd.Sc	1984	Hungarian Academy of Sciences, Budapest, Hungary
D.Sc.	1998	Hungarian Academy of Sciences, Budapest, Hungary
Habilitation	1999	University of Debrecen, Debrecen, Hungary
Position:	1999 -	Professor, University of Debrecen, Debrecen, Hungary

Specialization:

(i) main fields: coordination chemistry, solution eqv., bioinorganic chemistry
(ii) other fields: inorganic chemistry, analytical chemistry
(iii) current research interest: Solution equilibrium and structural studies on metal ion bio-ligand (e.g. amino acids, peptides, and derivatives, hydroxamic acids, aminohydroxamic acids, ...) systems.

Number of papers in refereed journals: 116
Number of chapters in boorks: 6
Number of communications to scientific meetings: 95

Publications in 2005-2007:

1. B. Bauer-Siebenlist, F. Meyer, E. Farkas, D. Vidovic and S. Dechert *Chem. Eur. J.*,2005, **11**, 1-13.
2. D. Bátka and E. Farkas *J. Inorg. Biochem,*2006, **100**, 27-35.
3 M. A. Santos, S. Gama, L. Gano and E. Farkas *J. Inorg. Biochem,*2005, **99,** 1845-1852
4. E. Farkas, D. Bátka, P. Buglyó and M. A. Santos *Metal Ions in Biology and Medicine,* 2006, **9**, 101-104
5. S. Gama, M. Gil, L. Gano, E. Farkas and M. A. Santos *Metal Ions in Biology and Medicine,* 2006, **9**, 105-110
6. E. Farkas, D. Bátka, E. Csapó, P. Buglyó, W. Haase and D. Sanna *Polyhedron,* 2007**, 26**,*543-554*
7. M. A. Santos, S. Gama, J. Costa Pessoa, M. C.Oliveira, I. Tóth, E. Farkas *Eur. J. Inorg. Chem., (in press)*
8 A. Preokofieva, A. I. Prokhodko, E. A. Enyedy, E. Farkas, W. Maringelle, S. Demishko, S. Dechert and F. Meyer *Inorg. Chem*., 2007, **46**, 4298-4307
9. E. Farkas and I. Sóvágó: Metal Complexes of Amino Acids and Peptides, in: Specialist Periodical Reports, Amino Acids, Peptides and Proteins, Vol. 35. (Senior reporters: G.C. Barrett and J.S. Davies), The Royal Society of Chemistry, Cambridge, 2006, pp. 353-434.
10. T. Kowalik-Jankowska, H. Kozlowski, E. Farkas and I. Sóvágó: Nickel Ion Complexes of Amino Acids and Peptides, in: Metal Ions in Life Sciences, Vol. 33. (Eds: A. Sigel, H. Sigel and R. K. O. Sigel), Wiley, 2007, ps. 63-109.11

Gáspár, Attila

Assistant Professor
Department of Inorganic and Analytical Chemistry

place and date of birth: Eger, 02.05.1970.
qualification: chemist, teacher of chemistry, translator in English
scientific degree: Ph.D (1997)
marital status: married, three daughters

Professional Career

University of Debrecen, Debrecen, Hungary	Chemistry	M.S. 1994
University of Debrecen, Debrecen, Hungary	Chemistry	Ph.D. 1997
Institute of Analytical Sciences, Dortmund, Germany		Post-Doc 1998
University of Debrecen, Debrecen, Hungary		Post-Doc 1999-2001
University of Debrecen, Debrecen, Hungary	Chemistry	Habil. 2005
California State University, Los Angeles, USA		Post-Doc 2006-2007

Positions

2001-present Assistant Professor, University of Debrecen, Debrecen, Hungary
1997-2001 Assistant Lecturer, University of Debrecen, Debrecen, Hungary

Publications in 2005-2007::

A. Gáspár, P.Juhász, K.Bágyi, *J.Chromatography A*, 2005, 1065, 327-331.
A.Gáspár, L.Gábor, *J.Chromatography A*, 2005, 1091, 163-168.
A.Gáspár, E.Dudás, *J.Chromatography A*, 2006, 1110, 254-260.
Á. Klekner, K. Bágyi, L. Bognár, A. Gáspár, M. Andrási, J. Szabó, *J. Clin. Microbiol*. 2006, 44, 3418.
M.Andrási, A.Gáspár, Á.Klekner, *J.Chromatography B*, 2007, 846 355-358.
M.Andrási, P.Buglyó, L.Zekany, A.Gáspár, *J. Pharmaceut. Biomed. Analysis*, 2007, 44, 1040.
A.Gaspar, M.E.Piyasena, F.A.Gomez, *Anal.Chem.*, 2007, 79, 7906-7909

Gáspár Vilmos
Full Professor
Department of Physical Chemistry

Date and place of birth: 25 May 1953, Salgótarján, Hungary

Education and academic degrees

1977 M.Sc. in chemistry
1990 C.Sc. degree
1995 Ph.D. in chemistry
1999 habilitation
2001 D.Sc. degree

Awards

1997 Fáy András Award for educational excellence
1998-2001 Széchenyi professorial fellowship
2003 Silver Cross of the Hungarian Republic
2006 Polányi Mihály senior award

Publications in 2005-2007:

Chaos **2006**, *16*, No. 033109
J. Phys. Chem. A **2005**, *109*, 9521.

Gyémánt, Gyöngyi
Assistant Professor
Department of Biochemistry

Year of birth: 1960

Education

MSc. in Chemistry, 1983, University of Lajos Kossuth, Debrecen
PhD in Chemistry, 2002, University of Debrecen

Positions

1983-1993 Analytical developing engineer, BIOGAL Pharmaceutical Works
1994-2001 Lecturer, Department of Biochemistry, University of Lajos Kossuth
2002- Assistant Professor, Department of Biochemistry, University of Debrecen

Educational area:

Biochemistry for pharmacists and chemical engineers. Biochemistry practicals for biologists and chemists.Bioanalytical courses: Chromatography, MS

Major research fields of interest

Separation and purity control of carbohydrates by GC, HPLC. Action pattern determination and subsite map calculation of amylases. Enzymatic synthesis of sugar derivative. Structural analysis of synthetic oligosaccharides and natural products by MALDI-TOF and ESI MS

Publications in 2005-2007:

1. J.E. Kerrigan, C. Ragunath, L. Kandra, G. Gyémánt, A. Lipták, L. Jánossy, J.B.Kaplan, N.Ramasubbu, Acta Biologica Hungarica, 56 (2008) accepted
2. Á. Zajácz, G. Gyémánt, L. Kandra, Carbohydr. Res. 342 (2007) 717-723
3. L. Kandra, M. A. Hachem, G. Gyémánt, B. Kramhoft, B. Svenson, FEBS Lett. 580 (2006) 5049-5053 Impact: 3,372
4. L. Kandra, J. Remenyik, G. Gyémánt, A. Lipták, Acta Biologica Hungarica, 57 (2006) 367-375.
5. L. Kandra, Á. Zajácz, J. Remenyik, G. Gyémánt, Biochem. Biophys. Res. Commun. (2005) 334 824-828.
6. N. Ramasubbu, C. Ragunath, K. Sundar, P. J. Mishra, G. Gyemant & L. Kandra, Biologia, Bratislava 2005, Volume 60, Supplement No. 15
7. L. Kandra, G. Gyémánt, J. Remenyik, C. Ragunath, N. Ramasubbu, Biologia, Bratislava 2005 Volume 60, Supplement No. 15.
8. L. Kandra, J. Remenyik, G. Batta, L. Somsák, G. Gyémánt, K. H. Park, Carbohydr. Res. (2005) 340. 1311-1317.

Harangi, János
Associate Professor
Department of Biochemistry

Date of birth: 22 June 1950
Degree: doctor habil, 2001
Employment: Department of Biochemistry, Faculty of Sciences, University of Debrecen, Hungary

Scientific performance:

Number of peer reviewed published and accepted papers:	46
Total impact factors of papers:	46.6
Number of independent citations	351
Number of books and book chapters:	2
Number of patents submitted:	4
Conference presentations:	34
of which oral presentations at international conferences:	21

Career:

1974-1989	research fellow, Department of Biochemistry, L. Kossuth University, Debrecen
1980	university doctor degree
1990-2003	sales representative, technical marketing engineer, Hewlett-Packard, Chemical Analysis Division (Budapest, Waldbronn – Germany)
1997	PhD degree (L. Kossuth University, Faculty of Sciences)
2001	doctor habil degree (University of Debrecen)
2003-2006	regional business development manager, IBM, Life Science and Health Care Informatics
2006-	associate professor, Department of Biochemistry, Faculty of Sciences, University of Debrecen

Educational activities:

1975-1989	separation technique sciences special lectures and practicum
1982-1989	biochemistry, consultant of graduate students
1990-1999	postgradual education at Faculty of Sciences, University of Debrecen
1999-2003	separation technique sciences and sales methodology for employees of Hewlett-Packard and Agilent

Current research activities:

1. Analysis of multicomponent samples by separation techniques
2. Theory and practice of high temperature liquid chromatography

Publications in 2005-2007:

L. Szente, J. Harangi, M. Greiner, F. Mandel *Chemistry and Biodiversity*, 3 (9) (2006) 1004-1014.

Horváth-Csajbók, Éva
Junior Assistant Professor
Department of Physical Chemistry

Year of birth: 1977

Education and academic degrees
2000 M.Sc. in chemistry
2005 Ph.D. in chemistry

Research interests: Catalytic hydrogenation of biomembranes and model membranes; NMR spectroscopy of biomembranes and model membranes

Publications in 2005-2007:
Chem. Eur. J. **2005**, *11*, 4799.
Adv. Inorg. Chem. **2005**, *57*, 239.

Joó, Ferenc
Full Professor
Department of Physical Chemistry

Place and date of birth: Tótkomlós (Hungary), Jan 06, 1949
Education and degrees:
Chemistry major, L. Kossuth University, Debrecen, Hungary, 1972
Ph.D. from the same university, 1975 (supervisor: Prof. M.T. Beck)
Doctor of Science (Hungarian Academy of Sciences) 1991
Member, Hungarian Academy of Sciences, 2001

Teaching and research positions:
Various positions in the Chemistry Department of L. Kossuth University, Debrecen (1972-1993), Professor of Chemistry: 1993-. Chair of the Institute of Physical Chemistry of the University of Debrecen: 1998- . Head of the Research Group on Homogeneous Catalysis, Hungarian Academy of Sciences (1995-). Vice rector (Academic) of the University (2004-2007). Vice Chairman of the Chemistry Section of the Hungarian Academy of Sciences (2005-).

Research activity:
Organometallic catalysts in aqueous systems. Phase transfer catalyzed organometallic reactions. Water soluble catalysts for modification of biological membranes by hydrogenation. Such modifications give information on the mechanism of stress tolerance of the cells. Catalytic hydrogenation of carbon dioxide in aqueous solutions, synthesis and catalytic application of N-heterocycle carbene complexes, and the use of ionic liquids in homogeneous and biphasic catalysis. 3 books, 114 research publications in refereed journals, ≥2250 independent literature citations

Awards:
Buzágh Award of the Hungarian Academy of Sciences, "Master Teacher" Award of the National Committee of Technical Development, Apáczai-Csere Prize, Ministry of Education, Hungary, Széchenyi Prize, The President of the Republic of Hungary

Publications in 2005-2007:
1.F. Joó, Á. Kathó: Hydrogenation and Hydrogenolysis, in Multiphase Homogeneous Catalysis Wiley-VCH, , 2005, pp. 187-196.
2. F. Joó, Á. Kathó: Two-Phase Aqueous Hydrogenations, in Handbook of Homogeneous Hydrogenation, Wiley-VCH, 2006, pp. 1327-1359.
3. H. H. Horváth, F. Joó: React. Kinet. Catal. Lett., 85, 355-360 (2005)
4. G. Papp, H. Horváth, Á. Kathó, F. Joó: Helvetica Chimica Acta, 88, 566-573 (2005)
5. J. Kovács, F. Joó, C. D. Frohning: Canadian J. Chem., 83, 1033-1036 (2005)
6. G. Kovács, G. Ujaque, A. Lledós, F. Joó: Organometallics, 25, 862-872 (2006)
7. G. Kovács, G. Schubert, F. Joó, I. Pápai: Catalysis Today, 115, 53-60 (2006)
8. Á. Zsigmond, ….. F. Joó: React. Kinet. Catal. Lett., 87, 297-304 (2006)
9. M. Fekete, F. Joó: Catal. Commun., 7, 783-786 (2006)
10. A. Rossin, …., F. Joó: Organometallics, 25, 5010-5023 (2006)
11. P. Csabai, F. Joó, et al: J. Organometal. Chem., 691, 3371-3376 (2006)
12. H. H. Horváth, G. Papp, C. Csajági, F. Joó: Catal. Commun., 8, 442-446 (2007)
13. Á. Zsigmond, S. Undrala, F. Notheisz, G. Papp, F. Joó: Catal. Lett., 115, 163-168 (2007)
14. G. Kovács, G. Ujaque, A. Lledós, F. Joó: Eur. J. Inorg. Chem., 2879-2889 (2007)
15. M. Fekete, F. Joó: Collect. Czech. Chem. Commun. 72, 1037-1045 (2007)
16. I. Jószai, F. Joó: React. Kinet. Catal. Lett. 91, 361-368 (2007)
17. T. Campos-M., M. Fekete, F. Joó, Á. Kathó, et al: J. Organometal. Chem., *accepted*

Juhász, László
Assistant Professor
Department of Organic Chemistry

Year of birth: 1973

Education and academic degrees

1996 M.Sc. in chemistry, University of Debrecen.
2001 Ph.D. in chemistry, University of Debrecen.

Positions:

Jan 2000. - Aug 2000.: Research assistant, University of Debrecen
Sept 2000. - June 2007: Assistant lecturer, University of Debrecen
July 2007 - Assistant professor, University of Debrecen

Awards

1999: Tempus Fellowship at the University of Paderborn, Germany (3 months)
2003-2006: Békesy György Postdoctoral fellowship
2005. June - 2005. november: Postdoctoral fellowship - University of Antwerp, Belgium - Prof. Dr. Luc Pieters
2005 - Kajtár Márton Award

Research interests:

Synthesis of O -heterocyclic compounds with biological activity, especially flavonoids, 2,3-dihydrobenzo[b]furan-type neolignans and 1,4-benzodioxanes. Application of NMR and CD spectroscopy for determination of their stereochemistry.
Synthesis of glycogen phosphorylase inhibitor and PPAR agonist compounds.
Using hypervalent iodine compounds and lipase catalyzed kinetic resolutions for the production of valuable chiral intermediates for the synthesis of biologically active molecules. Molecular modelling.

Publications and Conference Lectures:

Dissertations:1
Publications: 11.
Lectures and posters: 11 (international conference: 12, local conference: 10)
Independent citations:28

Membership of professional societies and organisations:

Flavonoid Chemistry Workinf Group of the Hungarian Academy of Sciences

Publications in 2005-2007:

Bioorg. Med. Chem. **2007**, *15*, 4048.

Juhász-Tóth, Éva
Junior Assistant Professor
Department of Organic Chemistry

Date and Place of birth: 11 November 1974, Sátoraljaújhely, Hungary

Education and academic degrees

1998 M.Sc. in chemsitry
2002 Ph.D. in chemistry

Positions:

Sept. 2001 - June 2003.: Research assistant, University of Debrecen
July 2003: Assistant lecturer, University of Debrecen

Research interests:

Synthesis of a-Azido-ketones and examination of their transformations into heterocycles.

Publications and Conference Lectures:

Dissertations:1
Publications: 2.
Lectures and posters: 15

Publications in 2005-2007:

Kathó, Ágnes
Associate Professor
Department of Physical Chemistry

Place and date of birth: Debrecen (Hungary), Jan 07, 1954

Education and degrees:
Chemistry major, L. Kossuth University, Debrecen, Hungary, 1977
Doctor Rer. Nat. from the same university, 1979 (supervisor: Prof. M.T. Beck)
Candidate of Science (Hungarian Academy of Sciences) 1991
PhD from L. Kossuth University, Debrecen, Hungary, 1994

Teaching and research positions:
Various positions in the Chemistry Department of L. Kossuth University, Debrecen
1977-1982 junior research fellow
1982-1988 research fellow
1988-1993 assistant professor
1993- senior research fellow

Research activity:
Study of the stoichiometric and catalytic reactions of nitrosyl complexes. Application of organometallic catalysts in aqueous systems and investigation of special effects of the water on the kinetics of the reactions. The heterogenization of homogeneous catalysts by sol-gel methods and study of phase transfer catalyzed organometallic reactions. Present interest includes catalytic hydrogenation/deuteration of unsaturated compounds and reactions with high atom efficiency (e. g. isomerisation and hydration). The preparation of water-soluble polymer-stabilized metal sols and their use in the hydrogenation of lipids.

Scientific record:
4 book chapters, 33 research publications in refereed journals, > 500 independent literature citations

Publications in 2005-2007:
1.F. Joó, Á. Kathó: Hydrogenation and Hydrogenolysis, in Multiphase Homogeneous Catalysis Wiley-VCH, , 2005, pp. 187-196.
2. F. Joó, Á. Kathó: Two-Phase Aqueous Hydrogenations, in Handbook of Homogeneous Hydrogenation, Wiley-VCH, 2006, pp. 1327-1359.
3. G. Papp, H. Horváth, Á. Kathó, F. Joó: Helvetica Chimica Acta, 88, 566-573 (2005)
4. T. Campos-M., M. Fekete, F. Joó, Á. Kathó, A. Romerosa, M. Saoud, W. Wojtkow J. Organometal. Chem., *accepted*

Kéki, Sándor
Associate Professor
Department of Applied Chemistry

Year of birth: 1964

Education:

University of Debrecen: Habilitation in Chemistry, Debrecen, 2004.
Kossuth Lajos University: Ph.D. in Chemistry, 1996.
Kossuth Lajos University: University Doctor, 1993.
Kossuth Lajos University: Chemist (M.Sc.), 1989.

Positions:

Associate Professor: 2004-
Assistant Professor: 1998-2003
Teaching and Research Assistant: 1989-1997

Professional Activities

Chairman of the Committee on Polymer Chemistry of the Hungarian Academy of Sciences in Debrecen (2005-), Secretary of the Committee on Materials Science and Technology of the Hungarian Academy of Sciences (2005-)

Awards and Fellowships:

Pro Scientia Medal, 1989, Bolyai Medal, 2003
Fellowship from the Hungarian Academy of Sciences (1989-1992)
Bolyai János Research Fellowship (1999-2002, and 2003-2006)

Publications in 2005-2007:

1. *J. Am. Soc. Mass Spectrom.*,**16**, 152 (2005)
2. *Eur. Polym. J.,* **41**, 1478 (2005)
3. *Macromolecules*, **38**, 4043 (2005)
4. *Rad. Phys. Chem.*, **74**, 247 (2005)
5. *Med. Hypothesis* **65**, 1091 (2005)
6. *Carb. Polym.* **63**, 136 (2006)
7. *J. Am.Soc. Mass Spectrom*, **17**, 962 (2006)
8. *Polym. Adv. Technol.* **17**, 945 (2006)
9. *J. Appl. Polym. Sci.* **103**, 287 (2006)
10. *Rapid Comm. Mass Spectrom.* **20**, 3374 (2006)
11. *Langmuir* **23**, 1014 (2007)
12. *Natural Prod. Comm,* **1**, 991 (2006)
13. *Metabolism, Clin.l Exp.,* **56**, 394 (2007)
14. *Cerebrovasc Dis.,* **23**, 388 (2007)
15. *Carbohyd. Res.* **342**, 1323 (2007)
16. *Langmuir* **23**, 5283 (2007)
17. *Rapid. Commun. Mass Spectrom.*, **21**, 1799 (2007)
18. *Adv. Func. Mater.* **17**, 1317 (2007)
19. *Rapid. Commun. Mass Spectrom.*, **21,** 2255 (2007)
20. *J. Polym. Sci. Polym. Chem.* (in press, 2007)

Kerékgyártó, János
Associate Professor
Department of Biochemistry

Year of birth: 1957
University/College Degrees: MSc Chemist
Academic degree: Ph.D./C.Sc.

Current place of employment, position indicated in the posting:
Department of Biochemistry, Centre of Arts, Humanities and Sciences, Faculty of Sciences and Technology, Debrecen, Senior Research Fellow

Science/Arts Academy fellowship:
1985-1988 Postgraduate scholarship from the Hungarian Academy of Sciences, 1986-1987 (13 months), 1990 (1 month), 1994-1995 (6 months) 1997 (2 months) fellowship from The Netherlands Foundation for Chemical Research (SON) and The Netherlands Organization for Scientific Research (NWO) to the Bijvoet Center, Department of Bio-Organic Chemistry, Utrecht University, Utrecht, The Netherlands. 1996 (3 weeks) Invited lecturel, Technical University of Darmstadt, Germany.

Honours:
Zemplén Géza Award from the Hungarian Academy of Sciences

Education activity up to now:
(lectures/seminars taught, time spent with teaching); Biochemistry lectures for students of biology, bio-technology, molecular biology, chemistry. Chemical bases of biology practice and seminars for students of biology, bio-technology, molecular biology, chemistry. Basic biochemistry lectures for pharmacists in english. Modern methods in oligosaccharide and glycopeptide synthesis lectures for Ph. D. students. Promotor for diploma and Ph. D. theses. Time spent with teaching: 23 years.

Presentation of work experience and achievements:
1981 MSc, 1994 C.Sc./Ph.D. Number of scientific publications: 27. Impact factor: 39.654. Number of SCI references: 314 Number of scientific lectures: 51. Number of patents: 2. Grants: OTKA F4066, MKM-170, OTKA T 019404.

Scientific/professional public activity, international collaborations:
Scientific/professional public activity: Member of the Committee of Carbohydrate Chemistry of the Hungarian Academy of Sciences
International collaborations: Bijvoet Center, Department of Bio-Organic Chemistry, Utrecht University, Utrecht, The Netherlands.

Publications in 2005-2007:
T. Pusztahelyi, Z. Molnár, T. Emri, É. Klement, M. Miskei, J. Kerékgyártó, J. Balla, I. Pócsi *Folia Microbiol*. **2006**, *51*, 547.

Keserű, György Miklós
unit head, honorary full professor
Richter Gedeon Inc., Budapest

Date of birth: 31 August 1967

Education and academic degrees

1986-1991	Technical University of Budapest, M.Sc. degree
1991	Technical University of Karlsruhe, Germany, post. grad. study
1991-1994	Technical University of Budapest, and Eötvös University, PhD
1994	C.Sc degree from Hungarian Academy of Sciences
1995.1996	Postdoc at Eötvös University
2002	Doctor of the Hungarian Academy of Sciences (D.Sc)
2003	Doctor habilitate of Budapest University of Technology and Economics
2003	Honorary Professor, Budapest University of Technology and Economics

Positions:

1996-1998	Sanofi-Synthelabo CHINOIN, Lab. Head
1999-	Gedeon Richter Ltd., Unit Head
1999-	Adjunct Professor at TUB

Awards

2000-2002 Bolyai János Research Fellowship
1994-1995 Magyary Zoltán Postdoctoral Fellowship
1995 Zoltán Földi Price in Organic Chemistry
1996 Young Investigators Award, Hungarian Chemical Society
1998 Academy Award, Hungarian Academy of Sciences
2001 George Olah Price of the Hunagrian Academy of Sciences

Memberships:

American Chemical Society (1996-), QSAR Society (1999-), Molecular Graphics and Modelling Society (2000-), Editoral board member of Molecular Diversity (2002-)

Publications in 2005-2007:

J. Biomol. Screening **2007**, *12*, 1068.
J. Chem Inf. Model. **2007**, *47*, 2366.
J. Comp. Aid. Mol. Des. **2007**, *21*, 539.
Bioorg. Med. Chem. Lett. **2007**, *17*, 5340.
Assay Drug Dev. Technol. **2007**, *5*, 75.
J. Med. Chem. **2007**, *50*, 901.
J. Mol. Graph. Model. **2006**, *25*, 363.
Drud. Disc. Today **2006**, *11*, 741.
J. Chem Inf. Model. **2006**, *46*, 1795.
Bioorg. Med. Chem. Lett. **2006**, *16*, 1037.
J. Med. Chem. **2005**, *48*, 7946.
FEBS Lett. **2005**, *579*, 5392.
Tetrahedron **2005**, *61*, 9375.
J. Mol. Struct. (Theochem) **2005**, *725*, 239.
J. Med. Chem. 2005, 48, 3749.
Comb. Chem. High Through. Screening **2005**, *8*, 347.

Kiss, Attila

Junior Assistant Professor
Department of Organic Chemistry

Date and place of birth: 16 May 1975, Marghita, Rumania

Education and academic degrees

1999 M.Sc. in chemistry, University of Debrecen
1999 Quality Control speacialts, QMF-TÜV Akademie
2001 Environmental and instrumental specialist, University of Debrecen
2005 Ph.D. in chemstry, University of Debrecen

Positions:

Febr. 2000 – Aug. 2000: Analyst, Teva-Biogal Rt.
Sept 2004: junior assistant professor, University of Debrecen

Memberships:

Hungarian Society of Separation Techniques

Publications in 2005-2007:

Dai, J.; Krohn, K.;Flörke, U.; Draeger, S.; Schulz, B.; Kiss-Szikszai, A.; Antus, S.; Kurtán, T.;van Ree, T. *Eur. J. Chem.* **2006**, 3498.
Patonay, T.; Kiss-Szikszai, A.; Silva, V.M.L.; Silva, A.M.S.; Pinto, D.C.G.A.; Cavaleiro, J.A.S.; Jekő, J. *Eur. J. Chem.* **2007**, accepted for publication

Kónya, Krisztina
Junior Assistant Professor
Department of Organic Chemistry

Year of birth: 1977

Education and academic degrees

2000 M.Sc. in chemistry and Hungarian-English chemical translation
2000 M.Sc. as teacher of chemistry
2005 Ph.D. in chemistry

Publications in 2005-2007:

Kövér, Katalin
Full Professor
Department of Inorganic and Analytical Chemistry

Year of birth: 1956

Education and academic degrees:

1979 M.Sc. in chemistry
1988 C.Sc. degree
2002 D.Sc. degree
2007 habilitation

Awards:

1998-2002 Széchenyi Istán Professorial Fellowship

Publications in 2005-2007:

J. Am. Chem. Soc. **2007**, *129*, 11579.
Magn. Res. Chem. **2007**, *45*, 745.
Arkvioc **2007**, 26.
Carbohyd. Res. **2007**, *342*, 1841.
Eur. J. Org. Chem. **2007**, 296.
Eur. Biophys. J. Biophys. Lett. **2006**, *35*, 459.
J. Magn. Res. **2006**, *181*, 89.
Carbohyd. Res. **2006**, *341*, 1312.
Magn. Res. Chem. **2006**, *44*, 467.
J. Magn. Res. **2005**, *176*, 199.
Carbohyd. Res. **2005**, *340*, 2328.
Biopolymers **2005**, *80*, 587.

Kurtán, Tibor

Assistant Professor
Department of Physical Chemistry

Date and place of birth: 1973. 02. 03. Berettyóújfalu, Hungary

Studies and research activity:
1991-1996: undergraduate studies at the Lajos Kossuth University as a chemist, Debrecen
1996: M.Sc. degree in chemistry. University of Debrecen
1996-1999: Ph.D. student (Chemistry program), University of Debrecen, Department of Organic Chemisry
1999: Tempus Fellowship at the University of Paderborn, Germany (3 months).
1999-2000: Fulbright Research Grant at the Columbia Universtiy, New York, USA (14 months)
2001: Ph.D. degree from the University of Debrecen.
2001-2006: assistant lecturer at the Department of Organic Chemistry, Debrecen
from 2006: assistant professor at the Department of Organic Chemistry, University of Debrecen

Publications: 31 research articles
Sum impact factor of publications: 67.14

Publications in 2005-2007:
1. *Chemistry & Biodiversity*. **2005** 2(6), 799-808.
2. *Eur. J. Org. Chem*. **2005** 19, 4061-4064**.**
3. *Eur. J. Org. Chem*. **2005**, *21*, 4563-4570.
4. *Heterocycl. Commun*. **2005**, *11*, *491-494*.
5. *Eur. J. Org. Chem*: **2006**, *15*, 3498-3506.
6. *Eur. J. Org. Chem*: **2007**, *2*, 292-295.
7. *Eur. J. Org. Chem*. **2007,** *2,* 296-305.
8. *Eur. J. Org. Chem*. **2007**, *7*, 1123-1129.
9. *Chirality*, **2007**, *19*, 464-470.
10. *J. Org. Chem*. **2007**, 72(9), 3521-3536.
11. *Langmuir,* **2007**, 23(10), 5283-5285.
12. *Eur. J. Org. Chem*. **2007**, 19, 3206-3211.
13. *Tetrahedron: Asymm*. **2007**, 18, 925-930.
14. *Eur. J. Org. Chem*. **2007**, 4845-4854.
15. *Chirality*, **2007**, available online.

Lázár, István

Associate Professor
Department of Inorganic and Analytical Chemistry

Professional qualifications:

1994	C.Sc. in Chemistry	The Hungarian Academy of Sciences, Hungary
1988	Ph.D. in Chemistry	Kossuth University, Debrecen, Hungary
1984	M.Sc. in Chemistry	Kossuth University, Debrecen, Hungary

Positions:

present-1996	Associate Professor of Chemistry	University of Debrecen
1996-1992	Assistant Professor of Chemistry	Kossuth University, Debrecen
1992-1987	Junior Assistant Professor of Chemistry	Kossuth University, Debrecen
1987-1984	postgraduate Ph.D. student	Hungarian. Acad. Sci., Budapest

Experience abroad:

1989-1991 and 1994	Research Associate	The University of Texas at Dallas, TX, USA

Publications (summary):

Papers:	37	(all in peer revied journals)
Cumulative impact factor:	71.1	
Number of independent references:	314	
Patents:	2 (USA), 1 (International)	
University textbooks:	2	
Book chapter in a monograph:	1	
Conference posters:	19	
Conference lectures:	33	

Publications in 2005-2007:

Stefanie Leonard, Ann Van Schepdael, Tímea Iványi, István Lázár, Jan Rosier, Marc Vanstockhem, Hans Vermeersch, Jos Hoogmartens, *Electrophoresis*, 26 (**2005**) 627-632

Zsolt Baranyai, Ernő Brücher, Tímea Iványi, Róbert Király, István Lázár, László Zékány, *Helvetica Chimica Acta* Vol 88 (**2005**) 604-617

János Elek, Debby Mangelings, Tímea Iványi, István Lázár and Yvan Vander Heyden, *Journal of Pharmaceutical and Biomedical Analysis*, (**2005**) Volume 38, Issue 4, 15 July 2005, 601-608

Tímea Iványi and István Lázár, *Synthesis-Stuttgart*, (**2005**) No. 20, Dec.11, 3555-3564

Peter Forlay-Frick, Debby Mangeling, Tímea Iványi, István Lázár, Károly Héberger, Yvan Vander Heyden, *Journal of Pharmaceutical and Biomedical Analysis* Volume 41 (**2006**) 1164.

Gyula Tircsó, Attila Bényei, Róbert Király, István Lázár, Róbert Pál, and Ernő Brücher, *Eur. J. Inorg. Chem.* **2007**, 701–713.

Lente, Gábor
Assistant Professor
Department of Inorganic and Analytical Chemistry

Date and place of birth : 6 December 1973, Debrecen, Hungary

Positions:

2004- assistant professor at the University of Debrecen, Hungary
2001-2004 junior assistant professor at the University of Debrecen, Hungary

Education and Degrees:

2007 habilitation
2001 Ph.D. graduation
1997 M.Sc. degree in chemistry
1997 degree of English-Hungarian translator in chemistry

Awards:

2006-09 *Bolyai János* research fellowship of the Hungarian Academy of Sciences
2004 *Polányi Mihály* young researcher award of the Hungarian Academy of Sciences
2003-06 *Békésy György* Postdoctoral fellowship
2002-03 *Fulbright* visiting researcher at *Iowa Sate University*, Ames, Iowa, US
2002 Honorable Mention for the 2002 *IUPAC Prize for Young Chemists*
2002 *Sigma-Aldrich Award* for young Hungarian researchers
1992 *Szent-Györgyi medal* of the Hungarian Chemical Society
1992 *Silver medal at the International Chemistry Olympics* in Pittsburgh, PA, US

Memberships in professional organizations:

2003- Hungarian Chapter of the American Chemical Society
2003- Kinetics and Photochemistry Working Group of the Hungarian Academy of Sciences
2003- Public Chamber of the Hungarian Academy of Sciences
2003- Hungarian Fulbright Alumni Association
2002- American Chemical Society
2002- Hungarian Chemical Society
2002- The Planetary Society
1999- American Association for the Advancement of Science

Publications in 2005-2007:

Physical Chemistry Chemical Physics, **2007**, *9*, 6134-6141.
Dalton Transactions, **2007**, 4268-4275.
New Journal of Chemistry, **2007**, *31*, 1707-1707.
Journal of the American Chemical Society, **2007**, *129*, 7738-7739.
Inorganic Chemistry, **2007**, *46*, 4230-4238.
Journal of Physical Chemistry A, **2006**, *110*, 12711-12713.
Dalton Transactions, **2006**, 955-960.
Journal of Physical Chemistry A, **2005**, *109*, 11058-11063.
New Journal of Chemistry, **2005**, *29*, 759-760.
Journal of the American Chemical Society, **2005**, *127*, 4785-4793.
Journal of Physical Chemistry B, **2005**, *109*, 1039-1047.
Green Chemistry, **2005**, *7*, 28-34.

Nagy, István
Associate Professor
Department of Physical Chemistry

Year of birth: 1964

Education and academic degrees:

1988 M.Sc. in chemistry and Hungarian-English chemical translation
1995 Ph.D. in chemistry
2001 habilitation

Awards:

1999-2002 Bolyai János Research Fellowship

Research interests:

Reaction kinetics, nonlinear dynamics; polimer chemistry, material science, computer aided image processing, infrared spectroscopy.

Publications in 2005-2007:

Macromol. React Eng. **2007**, *1*, 40.
J. Dentistry **2007**, *35*, 325.
Polymer J. **2006**, *38*, 364.

Nagy, Miklós
Assistant Professor
Department of Applied Chemistry

Year of birth: 1976

Education:

University of Debrecen: Ph.D. in Chemistry, 2005.
University of Debrecen: Chemist (M.Sc.), Hungarian-English translator in Chemistry 2000.

Experience:

Assistant Professor: 2007-
Teaching Assistant: 2002-2007

Awards and Fellowships:

Fellowship of the Hungarian Republic 1999
National Scientific Students' Associations Conference 3. prize 1999.

Publications in 2005-2007:

Sándor Kéki, Miklós Nagy, György Deák, Pál Herczegh, Miklós Zsuga, *J. Polym. Sci. Part A, Polym. Chem.* **42**, 587 (2004)

Miklós Nagy, László Orosz, Sándor Kéki, György Deák, Pál Herczegh, Miklós Zsuga, *Macromol. Rapid Commun.*, **25**, 1073 (2004)

Miklós Nagy, Sándor Kéki, László Orosz, György Deák, Pál Herczegh, Albert Lévai, Miklós Zsuga, *Macromolecules*, **38**, 4043 (2005)

Károly Süvegh; T. Marek, Attila Vértes, Rudolf Faust; Sándor Kéki, Miklós Nagy, Miklós Zsuga, *Rad. Phys. Chem.*, **74**, 247 (2005)

Miklós Nagy, László Szőllősi, Sándor Kéki, Miklós Zsuga, Langmuir 23 (3): 1014-1017 (2007)

László Orosz, Gyula Batta, Sándor Kéki, Miklós Nagy, György Deák, Miklós Zsuga, *Carbohydrate Research* 342 (10): 1323-1328 (2007)

Miklós Nagy, László Szőllősi, Sándor Kéki, Pál Herczegh, Gyula Batta, László Jicsinszky, Miklós Zsuga, *Journal of Polymer Science: Part A: Polymer Chemistry*, Vol. 45, 5149–5155 (2007)

Nagy, Noémi
Associate Professor
Department of Colloid and Environmental Chemistry

Year of birth: 1960

Scientific career:

1984. Master of Science (M.Sc) as a chemist and English-Hungarian translator, Kossuth Lajos University, Debrecen
1987. Ph.D. Kossuth Lajos University, Debrecen
1993. candidate of chemical science, Hungarian Academy of Sciences, Budapest
2003. habilitation, environmental science, University of Debrecen

Publications in 2005-2007:

N.M. Nagy, J. Kónya: Appl. Clay Sci. 28 (2005) 257-267.
J. Kónya, N. M. Nagy, M. Földvári: J.Thermal Anal. Calorimetry 79 (2005) 537-543.
Z.Nemes, N.M. Nagy, J. Kónya: J. Radioanal. Nucl. Chemistry 266 (2005) 289-293.
J. Kónya, N. M. Nagy, Z. Nemes: J.Coll.Interface Sci. 190 (2005) 350-356.
N. M. Nagy, J. Kónya: J.Coll.Interface Sci. 295 (2006) 173-180.
K. Halmy, J. Sefőző, J. Kónya, N. M. Nagy: Mycoses, 48 (2005) 308 .
Dombóvári P., Kádár P., Kovács T., Radó K., Varga I.,Varga K., Halmos P, Borszéki J., Kónya J., M. Nagy N., Kövér L., Varga D., Horváth A., Pintér T., Schunk J.: Korróziós Figyelő 45 (2005) 183-190
Z. Nemes, N. M. Nagy, A. Komlósi and J. Kónya: Appl. Clay Sci. 32 (2006) 172-178.
A. Komlósi, E. Kuzmann, Z. Homonnay, N. M. Nagy, S. Kubuki, J. Kónya: Hyperfine Interactions 166 (2006) 643-649 .
A. Komlósi, E. Kuzmann, N.M. Nagy, Z. Homonnay, S. Kubuki, J. Kónya: Clays Clay Miner. 55 (2007) 91-97.
P. Dombovári, P. Kádár, T. Kovács, K. Radó, I. Varga, R. Buják, K. Varga, P. Halmos, J. Borszéki, J. Kónya, N. M. Nagy, L. Kövér, D. Varga, I. Cserny, J. Tóth, L. Fodor, A. Horváth, T. Pintér, J. Schunk: Electrochim. Acta 52 (2007) 2542-51.
N. M. Nagy, J. Kónya: J. Coll. Interface Sci. 305 (2007) 94-100.
Halmy K., Serfőző J., Kónya J., Nagy N.: Bőrgyógyászati és Venerológiai Szemle 82 (2006) 233-237.
M.Nagy N., Kónya J.: Acta Geographica ac Geologica et Meterologica Debrecina 1 (2006) 51-60.

Nemes, Sándor
Assistante Professor
Department of Applied Chemistry

Year of birth: 1953

Education:
1973 − 1978: graduation in chemistry at Kossuth Lajos University in Debrecen
1983: University's Doctor Degree
1996: Ph. D. in Chemistry

Teaching Experience and Contributions to Teaching:
chemical technology, unit operations, environmental chemistry, plastics:
see at http://www.geocities.com/nemessandor2004/hallgatoknak.html

Experience abroad:
1988 − 1990. visiting scientist in Akron (Ohio, USA) at University of Akron, Institute of Polymer Science working with Prof. Joseph P. Kennedy.

Memberships in organizations:
1990− : Complex Material Science and Technological Working Group of the Hungarian Academy of Sciences
1997− : Public Chamber of the Hungarian Academy of Sciences
2000−2001 : Waste and Technology Assessment Committee at the Ministry of Environment

Current research interests:
chemical industry, plastics, waste management, higher education

Publications in 2005-2007:
Nemes, S.: Historical Profitability and Effectiveness Data of Plastics Manufacturers, (in Hungarian) Műanyag és Gumi, *42,* 295 (2005)
Nemes, S.: Realistic Options of Plastics Waste Management I − II, (in Hungarian) *ibid., 43,* 211 and 264 (2006)
Nemes, S.: What Will Be the Future of Green Plastics?, (in Hungarian) KöKéL, *33,* 253 (2006)
Nemes, S.: Environmentalism and Plastics Wastes, (in Hungarian) *ibid., 33,* 305 (2006)
Nemes, S.: Plastics from Renewable Resources, (in Hungarian) Magy. Kém. Lapja, *62,* 15 (2007)

Novák, Levente
Assistant Professor
Department of Colloid and Environmental Chemistry

Year of birth: 1967

Education and academic degrees:
1993 M.Sc. degree in biology
1998 Ph.D. in biology

Publications in 2005-2007:
Biomacromol. **2007**, *8*, 1624.

Patonay, Tamás

Full Professor
Department of Organic Chemistry

Year of birth: 1951

Academic Qualifications:
Master of Science (M. Sc.) [Chemistry]: Kossuth Lajos University, Debrecen, 1976
Doctor of University [Organic Chemistry]: Kossuth Lajos University, Debrecen, 1980
Candidate of Science [Chemistry], Hungarian Academy of Science, 1988
Doctor of Science (D.Sc.) [Chemistry]: Hungarian Academy of Science, 2002

Honours, Awards, Fellowships:
Pro Universitate by Kossuth Lajos University, Debrecen (1976), Order of Higher Education by Ministry of Education (1977), For Honoured Work by Ministry of Education (1986), FUNDP Fellowship (1996), Széchenyi Professor (1998), Novicardin Prize (2006)

Positions:
1982 - to date: Department of Organic Chemistry, University of Debrecen,
1982-1990: Senior Lecturer, 1990-2004: Associate Professor, 2004 - to date: Full Professor
1996: Departement de Chimie, Faculties Universitaire Notre-Dame de la Paix, Namur, Belgium, Visiting Research Associate
1993-1994: New Mexico State University, Las Cruces, USA, Visiting Research Associate
1976-1982: Research Group for Antibiotics of HAS, Debrecen, Hungary, Research Associate.

Research Interests:
Synthesis of Oxygen- and Sulfur Containing Heterocycles. Chemistry of 2-Azido-, 2-Halo- and 2-Sulfonyloxy Ketones. Application of New Oxidizing and Reducing Agents in the field of Heterocyclic Compounds. Asymmetric Oxidations and Reductions. Highly Efficient Synthetic Methods (Microwave-assisted and Paralel Syntheses).

Publications and Conference Lectures:
Dissertations: 3, Reviews: 6, Publications: 105. (Cumulative impact factor: 130.73, independent citations: 446). Lectures and posters: 225 (international conference: 121, local conference: 82, invited lectures: 22). Patents: 3

Membership of Professional Societies and Organizations:
Hungarian Chemical Society, Working Committee for Heterocyclic Compounds of the HAS, ACS, ACS Hungary Chapter, European Chemical Society, International Society of Heterocyclic Chemistry, Society of Combinatorial Sciences, Advisory Board of *European Journal of Organic Chemistry*, Editorial Advisory Board of the monography *Trends in Organic Chemistry*

Publications in 2005-2007:
Micskei, K.; Holczknecht, O.; Marchis, V.; Patonay, T.; Lévai, A.; Zucchi, C.; Pályi, G. *Chirality* **2005**, *17*, 511-514.
Micskei, K.; Patonay, T.; Pályi, G. *New Developments in Organometallic Chemistry Research*, *Chapter 4*, Cato, M.A., Ed., Nova: New York, 2006, pp. 91-115.
Santos, C.M.M.; Silva, A.M.S.; Cavaleiro, J.A.S.; Patonay, T.; Lévai, A. *J. Heterocycl. Chem.* **2006**, *43*, 1319-1326.
Santos, C.M.M.; Silva, A.M.S.; Cavaleiro, J.A.S.; Lévai, A.; Patonay, T**.** *Eur. J. Org. Chem.* **2007**, 2877-2887.

Pórszász, Róbert
Associate Professor
Institute of Pharmacology and Pharmacotherapy

Year of birth: 1965

Education and academic degrees

1989 M.D. at the University of Debrecen
1999 Ph.D. at the University of Debrecen
2005 habilitation at the University of Debrecen

Awards

1997-2000 Békéssy György postdoctoral fellowship
2000-2003 Bolyai János Research fellowship

Publications in 2005-2007:

Diabetes **2006**, *55*, A483.
Eur. J. Pharmacol. **2006**, *531*, 217.

Posta, József
Full Professor
Department of Inorganic and Analytical Chemistry

Year of birth: 1948

Education and academic degrees

1972 M.Sc. in chemistry
1990 C.Sc. degree
1991 M.A. in philosophy
1995 Ph.D.degree in chemistry
2000 D.Sc. degree
2001 habilitation, University of Debrecen

Awards

2000-2003 Széchenyi professorial fellowship

Publications in 2005-2007:

Acta Chim. Slov. **2007**, *54*, 551.
Food Chem. **2007**, *105*, 1209.
Microchem. J. **2007**, *85*, 103.
Microchem. J. **2007**, *85*, 109.
Microchem. J. **2006**, *82*, 61.
Pharmazie **2006**, *61*, 154.
Microchem. J. **2005**, *79*, 49.

Póta, György
Associate Professor
Department of Physical Chemistry

Date and plce of birth: 7 January 1954, Debrecen

Education and academic degrees

1978 M.Sc. (teacher of chemistry and physics)
1983 Ph.D. in chemistry
1992 C.Sc. degree

Positions

1978-1993 junior assistant professor and assistant professor, University of Debrecen
1993- associate professor, University of Debrecen

Publications in 2005-2007:

J. Phys. Chem. A **2006**, *110*, 5982.
J. Phys. Chem. A **2005**, *109*, 8336.

Rábai, Gyula
Full Professor
Department of Physical Chemistry

Year of birth: 1949

Education and academic degrees

1973 M.Sc. in chemistry, University of Debrecen
1976 Ph. D. in chemistry, University of Debrecen
1986 C.Sc. Degree
1998 D.Sc. degree

Positions

1973-1979 junior assistant professor, University of Debrecen
1979-1989 assistant professor, University of Debrecen
1989-2000 associate professor, University of Debrecen
2000- full professor, University of Debrecen
1988-90 and 1991-92: visiting researcher at Brandeis University
1993-94 and 1996: visiting professor at the Institute for Molecular Science (Japan)
1999 visiting professor at Hiroshima University, Japan

Publications in 2005-2007:

J. Phys. Chem. A **2005**, *109*, 10302.
J. Phys. Chem. A **2005**, *109*, 5398.

Somsák, László

Full Professor
Department Organic Chemistry

Place and date of birth: Miskolc (Hungary), 18 March 1954

Education and Degrees:

1973-1978	Studies in chemistry and graduation from the Lajos Kossuth University of Debrecen, Hungary
1978-1982	Postgraduate studies and research work under supervision of Professors István Farkas and Rezső Bognár at the above University
1983	Ph. D. from the above University
1991	Candidate of Chemical Science degree from the Hungarian Academy of Sciences, Budapest
1998	Habilitation at the Lajos Kossuth University of Debrecen, Hungary
2002	Doctor of the Hungarian Academy of Sciences

Positions held:

1978-1981	Research Fellow at the Research Group for Antibiotics Chemistry of the Hungarian Academy of Sciences, Debrecen
1981-1983	Assistant Lecturer...
1984-1993	Assistant Professor...
1993-2003	Associate Professor…
2003-	Full Professor at the Department of Organic Chemistry of the Lajos Kossuth University of Debrecen (University of Debrecen since 2000)

Awards:

1999-2002	Széchenyi Professorship
1999	George Olah Medal and Prize of the Hungarian Academy of Sciences

Publications in 2005-2007:

Elek, R.; Kiss, L.; Praly, J.-P.; Somsák, L. *Carbohydr. Res*., **2005**, *340*, 1397-1402.

Czifrák, K.; Szilágyi, P.; Somsák, L. *Tetrahedron: Asymmetry*, **2005**, *16*, 127-141.

Somsák, L.; Nagy, V.; Hadady, Zs.; Felföldi, N.; Docsa, T.; Gergely, P. Recent developments in the synthesis and evaluation of glucose analog inhibitors of glycogen phosphorylases as potential antidiabetic agents in *Frontiers in Medicinal Chemistry*, Eds. A. B. Reitz, C. P. Kordik, M. I. Choudhary, Atta-ur-Rahman, Bentham, Vol. 2., 2005, pp. 253-272.

Kandra, L.; Remenyik, J.; Batta, Gy.; Somsák, L.; Gyémánt, Gy.; Park, K. H. *Carbohydr. Res*., **2005**, *340*, 1311-1317.

Chrysina, E.D.; Kosmopoulou, M.N.; Tiraidis, C.; Kardakaris, R.; Bischler, N.; Leonidas, D.D.; Hadady, Z.; Somsák, L.; Docsa, T.; Gergely, P.; Oikonomakos, N.G. *Protein Sci.*, **2005**, *14*, 873-888.

Czifrák, K.; Kovács, L.; Kövér, K. E.; Somsák, L. *Carbohydr. Res*., **2005**, *340*, 2328-2334.

Anagnostou, E.; Kosmopoulou, M. N.; Chrysina, E. D.; Leonidas, D. D.; Hadjiloi, T.; Tiraidis, C.; Zographos, S. E.; Györgydeák, Z.; Somsák, L.; Docsa, T.; Gergely, P.; Kolisise, F. N.; Oikonomakos, N. G. *Bioorg. Med. Chem.*, **2006**, *14*, 181-189.

Czifrák, K.; Hadady, Zs.; Docsa, T.; Gergely, P.; Schmidt, J.; Wessjohann, L.; Somsák, L. *Carbohydr. Res.*, **2006**, *341*, 947-956.

Micskei, K.; Juhász, Zs.; Ratkovič, Z. R.; Somsák, L. *Tetrahedron Lett*., **2006**, *47*, 6117-6120.

Juhász, Zs.; Micskei, K.; Gál, E.; Somsák, L. *Tetrahedron Lett*., **2007**, 7351-7353.

Čolović, M.; Vukićević, M.; Šegan, D.; Manojlović, D.; Sojic, N.; Somsák, L.; Vukićević, R. D. *Adv. Synth. Catal*., accepted for publication

Sóvágó, Imre
Full Professor
Department of Inorganic and Analytical Chemistry

Place and date of birth: Debrecen, Hungary, 17 June 1946

Graduation:	1969, Chemistry L. Kossuth University, Debrecen, Hungary
Ph.D.:	1972, L. Kossuth University, Debrecen, Hungary
D.Sc. degree:	1991, (Doctor of the Chemical Sciences)
Present position:	Professor (since 1992) Head of the Department (1994 - 2005) Department of Inorganic and Analytical Chemistry, University of Debrecen, 4010 Debrecen, Hungary
Research interests:	Equilibrium and structural studies on the metal complexes of various bioligands including amino acids, peptides and nucleotides.
Total Number of publications :	142 (refereed Journals)
Total Number of citations:	1340

Publications in 2005-2007:

1. Cs. Kállay, K. Várnagy, G. Micera, D. Sanna and I. Sóvágó: *J. Inorg. Biochem*., **99**, 1514 (2005).
2. G. Di Natale, G. Grasso, G. Impellizzeri, D. La Mendola, G. Micera, N. Mihala, Z. Nagy, K Ősz, G. Pappalardo, V. Rigó E. Razzarelli, D. Sanna and I. Sóvágó, *Inorg. Chem*., **44**, 7214 (2005).
3. D. Grasso, G. Grasso, V. Guantieri, G. Impellizzeri, C. La Rosa, D. Milardi, G. Micera, , K. Ősz, G. Pappalardo, E. Rizzarelli, D. Sanna and I. Sóvágó, *Chem. Eur. J.*, **12**, 537 (2006).
4. E. Farkas and I. Sóvágó: Metal Complexes of Amino Acids and Peptides, in J.S. Davies (Ed.) *Specialist Periodical Reports*" (The Royal Society of Chemistry) Vol. 35 pp. 353-434 (2006)
5. V. Jószai, Z. Nagy, K. Ősz, D. Sanna, G. Di Natale, D. La Mendola, G. Pappalardo, E. Rizzarelli and I. Sóvágó: *J. Inorg. Biochem*., **100**, 1399 (2006).
6. I. Sóvágó and K. Ősz: *Dalton Trans*., 3841 (2006)
7. C. Kállay, K. Várnagy, G. Malandrinos, N. Hadjiliadis, D. Sanna and I. Sóvágó: Dalton Trans., 4545 (2006).
8. O. Szilágyi, K. Ősz, K. Várnagy, D. Sanna, H. Süli-Vargha, I. Sóvágó and G. Micera: *Polyhedron*, **25**, 3173 (2006)
9. Cs. Kállay, I. Sóvágó and K. Várnagy: *Polyhedron*, **26**, 811 (2007)
10. T. Kowalik-Jankowska, H. Kozlowski, E. Farkas and I. Sóvágó: Nickel(II) complexes of amino acids and peptides, in *Metal Ions in Life Sciences* (Ed. A. Sigel, H. Sigel and R.K.O. Sigel), (Nickel and Its Surprising Impact in Nature), **2**, 63-107 (2007)
11. P. Buglyó, E.M. Nagy, E. Farkas, I. Sóvágó, D. Sanna and G. Micera: *Polyhedron,* **26**, 1625-1633 (2007)
12. K. Ősz, Z. Nagy, G. Pappalardo, G. Di Natale, D. Sanna, G. Micera, E. Rizzarelli and I**.** Sóvágó**:** *Chem. Eur. J.*, **13**, 7129-7143 (2007)
13. C. Kállay, K. Ősz, A. Dávid, Z. Valastyán, G. Malandrinos, N. Hadjiliadis and I. Sóvágó: *Dalton Transaction,* 4040-4047 (2007)

Szekeres-Semsei, Edit
Teacher of English
Foreign Language Center of the Faculties of Science and Arts at the University of Debrecen

Year of birth: 1961

Education and academic degrees

1984 M. A. in history and public education
1993 M.A. in English language and literature

Publications in 2005-2007:

Szilágyi, László
Professor Emeritus
Department of Organic Chemistry

Yearand place of birth: 1941, Hajdúsámson, Hungary

Education and academic degrees:

1964: MSc in Chemistry, University L.Kossuth, Debrecen , Hungary
1971: PhD in Chemistry, University L.Kossuth, Debrecen , Hungary
1996: DSc in Chemistry, Hungarian Academy of Sciences

Positions:

1965-1972: Lecturer, Chair of Organic Chemistry, Kossuth University, Debrecen
1972-1987: Senior lecturer, Chair of Organic Chemistry, Kossuth University, Debrecen
1987-1997: Associate professor, Chair of Organic Chemistry, Kossuth University
1987-1989: Visiting research fellow, Stanford Magnetic Resonance Laboratory, Stanford University, CA, USA
1997-: Full professor, Chair of Organic Chemistry, University of Debrecen (formerly: University L.Kossuth)

Research interests:

NMR Spectroscopy, Carbohydrates: syntheses and structural studies, Aminoglycoside and Macrolide Antibiotics, Peptides, Protein NMR. More than 100 papers and reviews in international chemistry journals.

Memberships:

Member of the Editorial Advisory Board of "Letters in Organic Chemistry".

Publications in 2005-2007:

Carbohyd. Res. **2007**, *342*, 1841.
Mini Rev. Med. Chem. **2007**, *7*, 861.
Carbohyd. Res. **2006**, *341*, 2967.
Curr. Org. Chem. **2006**, *10*, 1745.
J. Med. Chem. **2005**, *48*, 1666.

Szurmai, Zoltán
Associate Professor
Department of Biochemistry

Date and Place of Birth: 19 June 1953. Miskolc (Hungary)

Education:

1972-1977	Chemist, Kossuth Lajos University, Debrecen, Hungary
1982	Ph.D. (organic chemistry, biochemistry), Kossuth Lajos University
1992	Candidatus degree, Hungarian Academy of Sciences

Positions Held:

1977-1983	Junior research fellow, Kossuth Lajos University, Department of Biochemistry, Debrecen
1983-1989	Research fellow, Kossuth Lajos University, Department of Biochemistry, Debrecen
1983-1984	Visiting fellow, NIH, NIA, GRC, Baltimore, U.S.A.
1988/1989	Visiting scientist, Ruhr-University, Bochum, Germany
1989-1990	Assistant, Kossuth Lajos University, Department of Biochemistry
1990-1993	First assistant, Kossuth Lajos University, Department of Biochemistry
1991-1992	Scholar of the French Government, University of Paris-South, Châteny-Malabry, France
1993-1995	Research Fellow, Kossuth Lajos University, Department of Biochemistry
1993	Visiting Research Fellow, Technical University, Institute of Organic Chemistry, Darmstadt, Germany.
1995-	Senior Research Fellow, Kossuth Lajos University, Department of Biochemistry, Debrecen
2000-	Senior Research Felow, University of Debrecen, Faculty of Sciences, Department of Biochemistry, Debrecen

Number of Scientific Publications:	29
Number of Scientific Books:	3
Number of Patents	4

Education activities:

1983-1995	Biochemistry practice for students of biology, biotechnology and chemistry
1994	Biochemistry lectures for students in chemistry
1995-	Chemical bases of biology lectures, practice and seminars for students of biology, biotechnology, molecular biology and chemistry
1990-	Promotor for diploma and Ph.D. theses

Research Interest:
Preparation of partially substituted monosaccharide derivatives. Syntheses of plant and bacterial oligosaccharides, spacered carbohydrate derivatives and neoglycoproteins. Preparation of glycan chains of high-mannose type *N*-glycoproteins, including β-mannosylation.

Publications in 2005-2007:

Tóth, Imre
Full Professor
Department of Inorganic and Analytical Chemistry

Education:

2003 D.Sc. degree
1990 C.Sc. degree
1979 Ph.D. in chemistry
1974 M.Sc. in chemsitry

Postgraduate Fellowships:

Department of Inorganic Chemistry, the Royal Institute of Technology, Stockholm, Sweden, (Guest Researcher 1984-85; 1990-91, 1997-98 and 2005-06)
Murdoch University, Western Australia, Perth (Visiting Fellow 1996, 3 months)
Fukuoka University, Japan (Guest Researcher, 1987, 1988 and 2001, 6 months)

Teaching Activities:

Lectures, laboratory practice sessions and seminars for chemistry, pharmacy and teacher students on general, inorganic and analytical chemistry, 1974-present.
Co-ordination Chemistry, Lecture course for Ph.D. students 1994-

Research:

Study of Equilibrium and Structure of Rare Earth-Aminopolycarboxylate Complexes using 1H-NMR Method, (PhD. D. thesis, 1979)
Solution Chemistry of III/B Group Cations by Multinuclear NMR (present)
Dynamics of Metal - Ligand Systems by NMR (present), Metal-metal Bonded Clusters (present), Mo(VI)-peroxo complexes (present)

Publications in 2005-2007:

1. M. A. Santos, S. Gama, J. C. Pessoa, M. C. Oliveira, I. Tóth, and E. Farkas *Eur. J. Inor. Chem.*, **2007**, 1728.
2. R. Jószai, M. Purgel, I. Pápai, H. Wakita and I. Tóth *J. Mol. Liq.***, 2007,** 131-132, 72.
3. R. Jószai, I. Kerekes, I. Satoshi, S. Kiyoshi, L. Zékány and I. Tóth *Dalton Trans.*, **2006**, 3221.
4. R. Jószai, I. Beszeda, A. C. Bényei, A. Fischer, M. Kovács, M. Maliarik, P. Nagy, A. Shchukarev and I. Tóth, *Inorg. Chem.,* **2005,** 44, 9643.
5. A Buvári-Barcza, I. Tóth, L. Barcza *Pharmazie,* **2005**, 60(9), 650.
6. I. Andersson, A. Gorzsás. Cs. Kerezsi, I. Tóth and L. Pettersson, *Dalton Trans.*, **2005**, 3658.
7. P. Nagy, A. Fischer, J. Glaser, A. Ilyukhin, M. Maliarik and I. Tóth**,** *Inorg. Chem.,* **2005**, 44, 2347-2357.
8. P. Nagy, R. Jószai, I. Fábián, I. Tóth and J. Glaser, *J. Mol. Liq.,* **2005,** 118, 195-207.

Várnagy, Katalin
Associate Professor
Department of Inorganic and Analytical Chemistry

Year of birth: 1961

Education and academic degrees

1985 M.Sc. (teacher of chemistry and mathematics) and German-Hungarian chemistry translation
1995 Ph.D. in chemistry
1999 habilitation

Awards

1998-2001 Bolyai János research fellowship
2002-2005 Széchenyi István fellowship

Publications in 2005-2007:

Eur. J. Inorg. Chem. **2007**, 4884.
Polyhedron **2007**, *26*, 811.
Polyhedron **2006**, *25*, 3173.
Dalton Trans. **2006**, 4545.
J. Inorg. Biochem. **2005**, *99*, 1514.
Polyhedron **2005**, *24*, 799.

Vibók, Ágnes
Full Professor
Department of Theoretical Physics

Year of birth: 1962

Education and academic degrees

1985 M.Sc.in physics
1990 Ph.D. in physics
1998 habilitation
2002 D.Sc. degree

Awards

1996-1997 Magyary Zoltán postdoctoral fellowship
1998-2001 Széchenyi Professorial fellowship

Publications in 2005-2007:

J. Chem. Phys. **2007**, *127*, Art. No. 144108.
J. Phys. A – Math. Theor. **2007**, 40, F267.
J. Chem. Phys. **2007,** *126*, Art. No. 154309.
J. Chem. Phys. **2006,** *125*, Art. No. 094102.
J. Chem. Phys. **2006,** *124*, Art. No. 081106.
J. Chem. Phys. **2006,** *124*, Art. No. 024312.
J. Phys. Chem. A **2005**, *109*, 3476.
J. Chem. Phys. **2005**, *122*, Art. No. 134109.
Int. J. Quant. Chem. **2005**, *101*, 186.

Zsuga, Miklós
Full Professor
Department of Applied Chemistry

Year of birth: 1944

Education and academic degrees

1969 M.Sc.(teacher of chemistry and physics)
1980 C.Sc. degree
1993 D.Sc. degree
1994 habilitation

Awards

1997-2001 Széchenyi Professorial fellowship

Publications in 2005-2007:

J. Polymer Sci A - Polymer Chem. **2007**, *45*, 5149.
Eur. J. Pharm. Sci. **2007**, *32*, S32.
Rap. Comm. Mass Spectrom. **2007**, *21*, 2255.
Carbohyd. Res. **2007**, *342*, 1323.
Rap. Comm. Mass Spectrom. **2007**, *21*, 1799.
Langmuir **2007**, *23*, 5283.
Cerebrovasc. Dis. **2007**, *23*, 388.
Metabol. Clin. Exp. **2007**, *56*, 394.
Langmuir **2007**, *23*, 1014.
J. Appl. Polymer Sci. **2007**, *103*, 287.
Polymer Adv. Technol. **2006**, *17*, 945.
Nat. Prod. Comm. **2006**, *1*, 991.
J. Am. Soc. Mass Spectrom. **2006**, *17*, 962.
Macromol Symp. **2006**, *233*, 217.
Carbohyd. Polymer. **2006**, *63*, 136.
Rad. Phys. Chem. **2005**, *74*, 247.
Eur. Polymer J. **2005**, *41*, 1478.
Rap. Comm. Mass Spectrom. **2005**, *19*, 1263.
Macromol. **2005**, *38*, 4043.
J. Am. Soc. Mass Spectrom. **2005**, *16*, 152.

Part 3

Official institutional regulations defining the study programme which is the subject of the application.

A kérelem címzettje:
Véleményező: Magyar Akkreditációs Bizottság

I. Adatlap

1. A kérelmező felsőoktatási intézmény **neve, címe:**

Debreceni Egyetem, H-4032 Debrecen Egyetem tér 1.

2. **Kari tagozódású** felsőoktatási intézmény esetén a **képzésért felelős kar megnevezése:**

Természettudományi Kar

3. Az indítandó **mesterszak megnevezése:** **vegyész**

4. Az oklevélben szereplő **szakképzettség** megnevezése: **vegyész**

5. Az oklevélben szerepeltetni kívánt **szakirány(ok)** megnevezése:

szintetikus kémiai szakvegyész

analitikus szakvegyész

6. A képzési idő

- a **félévek,** valamint az oklevél megszerzéséhez szükséges **kreditek** száma: **4 félév, 120 kredit**
- az összóraszámon (összes hallgatói tanulmányi munkaidőn) belül a **tanórák** (kontaktórák) száma: **1200 – 1250 óra (*a választható tárgyak óraszámától függően*)**
- a szakmai gyakorlat időtartama és jellege (ha van). –

7. A szak **indítás**ának tervezett **időpontja***:* **2007. szeptember 1.**

8. A szakért felelős oktató megnevezése és aláírása

.....
Dr. Sóvágó Imre
egyetemi tanár

9. Dátum, és az intézmény felelős vezetőjének megnevezése és cégszerű aláírása:

.....
Debrecen, 2006. június 26. **Dr. Nagy János**
gyetemi tanár, rektor

Part 4

An example of the Diploma Supplement issued by the institution.

DIPLOMA SUPPLEMENT

Number of diploma in the registry of students:
, year:

1 HOLDER OF THE QUALIFICATION

1.1 Family name(s)
1.2 Given name(s)
1.3 Date of birth (day/month/year)
1.4 Student identification number or code

2 IDENTIFICATION OF THE QUALIFICATION

2.1 Name of qualification and (if applicable) title conferred (in original language)
2.2 Main field(s) of study for the qualification
2.3 Name and status of awarding institution
2.4 Name and status of institution (if different from 2.3) administering studies
2.5 Language(s) of instruction/examination

3 LEVEL OF THE QUALIFICATION

3.1 Level of qualification
3.2 Official length of program
3.3 Access requirements

4 RESULTS

4.1 Mode of study

4.2 PROGRAM REQUIREMENTS

4.2.1 Program requirements act number

4.2.2 Aim of study

4.2.3 Evaluation of acquired credit

4.2.4 System of knowledge checking

4.2.5 Required professional practice, credit value

4.3 PROGRAM DETAILS, AND THE INDIVIDUAL GRADES/MARKS/CREDITS OBTAINED

/ term I. semester

, credit points:

Subject
Subject code
Lessons per week
Requirement
Credit points
Grade
Date

If the number of lessons contains / marks, like in le/p/ly, its meaning is: number of lectures/class practices/laboratories.

/ term II. semester

, credit points:

Subject
Subject code
Lessons per week
Requirement
Credit points
Grade
Date

If the number of lessons contains / marks, like in le/p/ly, its meaning is: number of lectures/class practices/laboratories.

4.4 Grading scheme and, if available, grade distribution guidance

4.5 Overall classification of the qualification

5 FUNCTION OF THE QUALIFICATION

5.1 Access to further study

5.2 Professional status (if applicable)

6 ADDITIONAL INFORMATION

6.1 Additional information

6.2 Further information sources

Information concerning the Diploma Supplements in Hungary is available from the DS home page of the Hungarian Ministry of Education (when issuing this document, this is http://www.om.hu/ds/), or from that of the Hungarian Europass Centre (when issuing this document, this is http://www.europass.hu/ds/). Verification of a printed diploma supplement can be performed starting from the above pages. International information is available starting from the ENIC/NARIC home page: http://www.enic-naric.net/.

7 CERTIFICATION

7.1 Date

7.2 Name and signature

7.3 Capacity

7.4 Official stamp or seal

8 THE HUNGARIAN HIGHER EDUCATION SYSTEM

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Admission requirements for higher education
According to the Higher Education Act No. 80 of 1993, the basic requirement for admission to college (non-university higher education institution) and university graduate education is the Hungarian secondary school leaving certificate (Érettségi bizonyítvány), or a foreign equivalent, or a degree obtained in higher education. The secondary school leaving certificate is conferred after eight years of primary education followed by four years of secondary education in a comprehensive/academic secondary school (gimnázium) or vocational secondary school (szakközépiskola). It must be noted that the division of the twelve years of study may vary: it may also be divided into 4 or 6 years of primary education and 8 or 6 years of secondary education.
Admission to higher education institutions - with some exceptions - is based on the applicant's secondary school achievements and on the results of the competitive entrance examinations.
Higher education institutions
The Hungarian higher education has a dual system consisting of universities (egyetem) and colleges (főiskola). Universities are such higher education institutions that are able to organise courses in more than one field of science and within a field of science in several branches; carry out scientific research activity and have accredited PhD/DLA courses. Colleges organise more than one training course in a branch of science or in a field of the arts. Hungarian higher education institutions are autonomous, state or non-state institutions recognised by the state. The appendix of the Higher Education Act No. 80 of 1993 lists all recognised higher education institutions (www.naric.hu).
Accreditation and quality assurance
The Hungarian Accreditation Committee established in 1993 is responsible for accrediting and evaluating the quality of teaching and research at higher education institutions. It assesses the standard of education and research in each higher education institution at least in every eight years (institutional accreditation) based on a detailed self-assessment of the institution and the report of a visiting committee. The Hungarian Accreditation Committee also examines the curricula, the qualification requirements as well as the quality of the academic staff and the

teaching facilities (program accreditation).

Degrees and qualifications

Hungarian universities and colleges grant degrees following a binary pattern. Colleges and universities grant "Főiskolai oklevél" (college-level degree) and universities award "Egyetemi oklevél" (university-level degree). The duration of training at college level requires minimum 3 years and maximum 4 years of studies, while the length of study at university level is minimum 4 years, maximum 5 years (one of the few exceptions is the medical course where the duration of education is 6 years). Students complete their education with a final examination consisting of the preparation and defence of a dissertation, oral and/or written examinations prescribed in the qualification requirements and - in certain programs - the performance of practical work.

Beyond university and college graduate education, 2 types of post-graduate programs are offered by higher education institutions. First, further specialisation degrees can be awarded after college or university graduation. These further specialisation programs lead to new qualifications. Studies may vary from one to three years' duration.

Secondly, universities provide training leading to a doctoral degree, which is the only scientific degree available in Hungary at present. The condition for applying for doctoral training is a Hungarian university degree or its foreign equivalent. Higher education institutions link admission to entrance examinations and often to additional criteria (e.g. professional experience). The duration of the training is at least 3 years, at the end of which a doctor of philosophy (PhD - doktori fokozat) or a doctor of liberal arts (DLA - mester fokozat) degree is conferred depending on the field of science.

Credit system

The obligatory use of the ECTS compatible credit system was introduced in September 2003, but several higher education institutions have already been using it since the middle of the 1990s. According to the governmental decree on the introduction of the credit system one credit corresponds to 30 hours student workload. The minimum number of credits for a college-level degree is 180, for a university-level degree is 240, for a further specialisation degree is 60 while for the doctoral degree it is 180.

System of assessment

The assessment of knowledge may occur, generally in five grades: excellent (5), good (4), satisfactory (3), pass (2), and fail (1) or with the classification: excellent (5), satisfactory (3), fail (1).

Academic year

In general, the academic year of higher education institutions consists of two semesters, namely the autumn and the spring semesters. The autumn semester lasts generally from the beginning of September until the end of January. The spring semester lasts from the beginning of February until the end of June. In general, both semesters include a 15-week period for lectures, seminars and practical work and a 6-week examinations period.

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
Accreditation dates and statute numbers:
Debrecen University of Agricultural Sciences: 1996 XII. 17., MAB/1996/10/II/1.
Debrecen Medical University: 1996. VII. 5., OAB/1996/6/II/6
Wargha István College of Education, Hajdúböszörmény: 1996.VII. 5., OAB/1996/6/II/2
Kossuth Lajos University of Arts and Sciences: 1996. VII. 5., OAB/1996/6/II.5.
Number of Faculties at the University of Debrecen: 14

Faculty of Agroeconomics and Rural Development	Faculty of Law
Faculty of Medicine	Faculty of Arts
College Faculty of Health	Faculty of Dentistry
Faculty of Pharmacy	College Faculty of Education in Hajdúböszörmény
Faculty of Informatics	Faculty of Economics and Business Administration
Faculty of Agriculture	College Faculty of Engineering
Faculty of Public Health	Faculty of Natural Sciences

Independent Institutions:
Conservatory of the University of Debrecen
Number of accredited programmes at the University of Debrecen:
76 degree programmes with the Pre-Bologna 5-year-system university education, 51 degree programmes with the Pre-Bologna 3-year-system college education, 12 BSc programmes according to the Bologna system, 40 supplementary degree programmes offering transfer-degree continuation of studies towards the university degree (MSc), 4 specializations offering post-secondary vocational certificates and 105 vocational programmes.
Number of Students at the University of Debrecen: *28366*
according to time of studies: 17 687 full-time students, 10 372 part-time students having week-end classes and 307 part-time students having evening classes or distance education
according to education level: 217 students at post-secondary vocational level, 1111 students at BSc, 9198 students at college level, 15233 students at university level (MSc), 1756 students at vocational programmes, 851 students at PhD, 1343 foreign students.
Full time teachers of the University of Debrecen: 1449
199 full college/university professors and 815 lecturers with a PhD