

Specialistic courses

Laboratory methods in inorganic chemistry (CHP)

Type of course: compulsory for Fundamental Chemistry studies, specialization Inorganic Chemistry

Level of course: advanced level – 1st year of Masters studies, Fundamental Chemistry studies, specialization Inorganic Chemistry

Number of credits allocated, workload based: 4 ECTS

Name of lecturer: Witold Rybak, PhD

Objective of the course: knowledge of more advanced techniques used in synthesis and isolation of inorganic compounds, in addition to application of chemical physics methods used in inorganic chemistry

Course contents:

The preparation methods and chemical properties of anhydrous metal halides, organometallic compounds of s-, p- and d-block elements, cluster compounds and transition metal complexes with small molecules. On your own synthesis of several complexes with use of vacuum, low or high temperature techniques, and avoiding moisture or dioxygen contamination. Practice in structural characterisation of obtained compounds using spectroscopic methods: UV-VIS, IR, FIR, NMR, EPR, MS, and Mössbauer. Application of gas, liquid and ionic chromatography. Chromatography in supercritical conditions. Combined methods. Thermal analysis. Speciative, multicomponent, local and structural analysis. Radiometric methods.

Recommended reading

- ✓ F.A. Cotton, G. Wilkinson, C.A. Murillo and M. Bochmann, Advanced inorganic chemistry, 6-th edit, Wiley, New York 1999.
- ✓ D.F. Shriver, P.W. Atkins, C.H. Langford, Inorganic chemistry, 4-th edit, Oxford 2006.
- ✓ J.D. Woollins (edit.), Inorganic Experiments, 2-nd edition, Wiley-VCH, Weinheim 2003.
- ✓ R.J. Angelici, Synthesis and techniques in inorganic chemistry, Sounders, Philadelphia 1977.
- ✓ D.F. Shriver and M. A. Drezdon, The manipulation of air-sensitive compounds, Wiley, New York 1986.

Teaching methods: Laboratory lessons: 8 hours/week, for 7,5 weeks

Assessment methods:

Laboratory lessons: permanent evaluation – examination both theoretical and practical preparation to deal with topics related with the intended experiments. There is a chance to repeat of two failed experiments and to present the written report on the results obtained from applied spectroscopic methods, at the end of the semester. The guidance and evaluation of student achievements in English are also available if required.

Laboratory methods in chemical physics (CHP)

Type of course: compulsory for Fundamental Chemistry studies, specialization Inorganic Chemistry

Level of course: advanced level – 1st year of Masters studies, Fundamental Chemistry studies, specialization Inorganic Chemistry

Number of credits allocated, workload based: 4 ECTS

Name of lecturer: Witold Rybak, PhD

Objective of the course: knowledge of more advanced techniques used in synthesis and isolation of inorganic compounds, in addition to application of chemical physics methods used in inorganic chemistry

Course contents:

The preparation methods and chemical properties of anhydrous metal halides, organometallic compounds of s-, p- and d-block elements, cluster compounds and transition metal complexes with small molecules. On your own synthesis of several complexes with use of vacuum, low or high temperature techniques, and avoiding moisture or dioxygen contamination. Practice in structural characterisation of obtained compounds using spectroscopic methods: UV-VIS, IR, FIR, NMR, EPR, MS, and Mössbauer. Application of gas, liquid and ionic chromatography. Chromatography in supercritical conditions. Combined methods. Thermal analysis. Speciative, multicomponent, local and structural analysis. Radiometric methods.

Recommended reading

- ✓ F.A. Cotton, G. Wilkinson, C.A. Murillo and M. Bochmann, Advanced inorganic chemistry, 6-th edit, Wiley, New York 1999.
- ✓ D.F. Shriver, P.W. Atkins, C.H. Langford, Inorganic chemistry, 4-th edit, Oxford 2006.
- ✓ J.D. Woollins (edit.), Inorganic Experiments, 2-nd edition, Wiley-VCH, Weinheim 2003.
- ✓ R.J. Angelici, Synthesis and techniques in inorganic chemistry, Sounders, Philadelphia 1977.
- ✓ D.F. Shriver and M. A. Drezdon, The manipulation of air-sensitive compounds, Wiley, New York 1986.

Teaching methods: Laboratory lessons: 8 hours/week, for 7,5 weeks

Assessment methods

Laboratory lessons: permanent evaluation – examination both theoretical and practical preparation to deal with topics related with the intended experiments. There is a chance to repeat of two failed experiments and to present the written report on the results obtained from applied spectroscopic methods, at the end of the semester. The guidance and evaluation of student achievements in English are also available if required.

Laboratory methods in chemical physics (CHP)

Type of course: compulsory for Fundamental Chemistry studies, specialization Chemical Physics

Level of course: advanced level – 1st year of Masters studies, Fundamental Chemistry studies, specialization Chemical Physics

Number of credits allocated, workload based: 4 ECTS

Names of teachers: Sławomir Berski, PhD; Adriana Olbert-Majkut, PhD; Halina Podsiadły, PhD

Objective of the course: application of selected physical and computational methods in analytical and structural studies.

Course contents

Practical exercises in quantum pharmacology. Application of computational quantum chemistry to solve problems of molecular

pharmacology and medicinal chemistry. Semiempirical and ab initio quantum methods; conformational equilibria, solvation, charge distributions, dipole moments, electrostatic potential. Simulation of IR, UV, NMR and ESR spectra.

A qualitative and quantitative analysis of active ingredients in the selected drugs and vitamins by means of spectroscopic and potentiometric methods. The physico-chemical studies are preceded by the extraction of the individual substances from the corresponding groups of medicines. Laboratory work consists of qualitative analysis by infrared, Raman, electronic and nuclear magnetic resonance (NMR) spectroscopy. UV-vis spectroscopy and potentiometric titration are used for the quantitative analysis.

Recommended reading

- ✓ HyperChem (Release 3 for Windows); 1993, Autodesk, Inc.
- ✓ T. Clark, Handbook of Computational Chemistry, 1985, John Wiley & Sons.
- ✓ P. Norton, H. Hahn, Petera Nortona Przewodnik po Unixie, Wydawnictwo PLJ, Warszawa 1993.
- ✓ J. Sadlej, Spektroskopia molekularna
- ✓ W. Zieliński, A. Rajca (wyd.) Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych.

Teaching methods: Laboratory: 4h. x 15 weeks =60 h

Assessment methods

Students are evaluated and credited on the basis of their activity, organization and effectiveness in the course of the laboratory and on the basis of both written and oral reports on their achievements.

Courses for choice

Protein chemistry

(This lecture is suspended temporarily)

Type of course: elective

Level of course: advanced level - 3rd year of licentiate studies or 1st year of Master's studies

Number of credits allocated, workload based: 2 ECTS

Name of lecturer: Professor Zbigniew Szewczuk

Objective of the course: knowledge of peptide and protein chemistry, with emphasis peptide synthesis and chemical modification of proteins.

Prerequisites: knowledge of organic chemistry on the university licentiate level

Course contents: Chemical properties of amino acids. Synthesis of peptides and peptidomimetics. Protein purification and characterization. Chemical and enzymatic modifications of proteins. Proteomic. The structure and function of selected peptides and proteins. Molecular recognition, structural basis of immunochemistry and enzymology.

Recommended reading

- ✓ Sewald, N., Jakubke, H.B., Peptides: Chemistry and Biology. Wiley-VCH Verlag GmbH&Co. KGaA 2002
- ✓ Siemion, I.Z. Biostereochemia, PWN, Warszawa 1985.
- ✓ Scopes, R.K., Protein Purification, Principles and Practice, Springer-Verlag, New York 1994.
- ✓ Dennison, C. A guide to protein isolation, Kluwer Academic Publishers, New York, Boston, London, Moscow 2002
- ✓ Lubbad, R. Techniques in protein modification, CRC Press, Boca Raton-Ann Arbor-London-Tokyo 1995.

Teaching methods: Lecture: 2 hours/week, 15 weeks

Assessment methods: Lecture: Exam (written – problems to be solved).

Class credit: (final test at the end of semester or written works in the form of a presentation)

Combinatorial Chemistry

(This lecture is temporarily suspended)

Type of course: elective (temporarily inactive)

Level of course: advanced level - 1st year of Master's studies (for Biological Chemistry students – also 3rd year of licentiate studies)

Number of credits allocated, workload based: 2 ECTS

Name of lecturer: Alicja Kluczyk, PhD; Piotr Stefanowicz, PhD

Objective of the course: fundamentals of combinatorial chemistry. Design and synthesis of biologically active compounds. Application of combinatorial libraries in medicinal, organic and analytical chemistry. Combinatorial methods in material science.

Prerequisites: organic chemistry course should be already credited. Solid-Phase Organic Synthesis course should be already credited or selected for the same semester.

Course contents: Lecture: Combinatorial chemistry. Combinatorial libraries. Natural libraries: immune response, proteins, antibiotics, polyketides, phage systems and viruses. Synthetic and virtual libraries. Combinatorial biosynthesis. General and focused libraries, library design, deconvolution. Chemical diversity, Synthetic and analytical procedures, screening protocols, HTS. Application of combinatorial libraries in biological and organic chemistry as well as in analytical chemistry and material science. Development of inhibitors and catalysts. Bioinformatics and data mining. Laboratory: Classical organic synthesis, solid phase chemistry and polymer-assisted solution synthesis. Design of a library, synthesis, analysis, prediction of physicochemical and biological properties. Evaluation of synthetic methods.

Recommended reading

- ✓ G. Jung (Ed.), Combinatorial Peptide and Nonpeptide Libraries, VCH, 1996.
- ✓ L.A. Thompson, J.A. Ellman, Synthesis and Applications of Small Molecule Libraries, Chem. Rev., 555, 96, 1996.
- ✓ P. Seneci, Solid phase synthesis and combinatorial technologies, Wiley 2000.
- ✓ S. Miertus, G. Fassina, Combinatorial chemistry and technology, Dekker 1999.
- ✓ Journal of Combinatorial Chemistry (ACS)

Teaching methods: Lecture: 2 hours/week, 8 weeks (after Solid Phase Organic Synthesis course)

Laboratory lessons: 30 hours (two whole-day laboratory sessions + introductory and final meetings)

Assessment methods: The lecture is credited (on the basis of attendance only), for a grade – written semester work (required in case of more than 3 absences). For students who selected both Solid-Phase Organic Synthesis and Combinatorial Chemistry, there is an option of exam (oral, presentation and discussion of a written work). The examination could be conducted in English.

Laboratory: synthesis project (entry condition), completion of synthetic experiments and data analysis, written report.

Geochemistry

Type of course: elective

Level of course: fundamental - 3rd year of licentiate or 1st year of Masters course

Number of credits allocated, workload based: 2 ECTS

Name of lecturer: Professor Adam Jeziński

Objective of the course: knowledge of fundamental geochemical processes

Prerequisites: General Chemistry course already credited

Course contents: Geochemistry as natural history of chemical elements. Elements of cosmology. Synthesis of chemical elements and chemical compounds in Cosmos. History and composition of Earth. Geochemical classifications of the chemical elements. Main types of rocks, the most important minerals. Geochronology and radioisotope dating method. Geochemical properties of chemical elements. Fundamental geochemical processes: formation of igneous rocks, metamorphism, weathering processes, formation of sedimentary rocks. Physical and chemical methods of rocks and minerals investigation. Isotopic geochemistry. Geochemical systems and geochemical cycles. Waters. Organic geochemistry: soil, coals, organic sediments. Elements of regional geochemistry of Lower Silesia.

Recommended reading

- ✓ Polański, Podstawy geochemii, Wydawnictwa Geologiczne, Warszawa 1988; także dalsze wydania
- ✓ F. Albarede, Geochemistry, Cambridge University Press, 2003
- ✓ G. Ottonello, Principles of Geochemistry, Columbia Univ. Press, N.Y., 1997
- ✓ R.W. Fairbridge (Ed.), The Encyclopedia of Geochemistry and Environmental Sciences, Van Nostrand Reinhold Comp., N.Y., od 1992

Teaching methods: Lecture: 2 h/week, 15 weeks

Geochemical excursion to the Sudety Mountains

Preparation of monographic paper devoted to a defined geochemical problem

Assessment methods: Preparation of the monographs or examination

English in organic chemistry

Type of course: elective

Level of course: advanced level - 1st year of Master's studies

Number of credits allocated, workload based: 1 ECTS

Name of lecturer: Alicja Kluczyk, PhD

Objective of the course: the understanding and proper use of professional English vocabulary related to organic chemistry. Nomenclature of organic compounds. Laboratory equipment, synthetic procedures. Finding and using information in organic chemistry.

Prerequisites: licentiate in courses listed in the recruitment rules. Good working knowledge of English required.

Course contents

The seminar is intended as a preparation for use of English scientific literature in future studies of organic chemistry. The idea is to provide students with knowledge required to use chemical information in English (books, research papers, analytical data, MSDS, Internet sources). The topics range from reading English texts and searching for specific information, to names of chemical compounds and laboratory equipment. Abbreviations and acronyms. Understanding of synthetic procedures. Colours, aromas and tastes. Differences in meaning of some words in chemical research and everyday language.

Recommended reading

- ✓ P. Domański, English through Chemistry, WSiP 1991.
- ✓ P. Domański, English in Science and Technology, WNT 1993.
- ✓ R. Macpherson, English for Academic Purposes, PWN 2004.
- ✓ A.W. Kierczak, English for Pharmacists, Wydawnictwo Lekarskie PZWL 1999.
- ✓ Słownik chemiczny angielsko-polski i polsko-angielski, WNT 2003.

Teaching methods: Seminar: 1 hour/week, 15 weeks

Assessment methods

Permanent evaluation – active participation in classes, regular short written works (homework practice: translations, answers for text-based questions), classroom written works (twice in a semester, translation of chemical text, dictionary use allowed)

Inorganic drugs

Type of course: elective

Level of course: advanced, 3rd year of licentiate studies or 1st year of Master's studies

Number of credits allocated, workload based: 2 ECTS

Name of lecturer: Professor Henryk Kozłowski

Objective of the course: introduction to modern inorganic drug chemotherapy, mechanisms of drug action, relation of inorganic chemistry to medical diagnosis and pharmacology.

Prerequisites: knowledge on basic inorganic, coordination and bioinorganic chemistry

Course contents

Metals in medicine and biology. Chemotherapy and toxicology of metals. Biochemical targets of inorganic drugs. Interaction of metal ions with DNA and other biomolecules. Platinum anticancer drugs. Non-platinum potential anticancer drugs e.g. based on ruthenium. Antibacterial and antiviral inorganic drugs. Contrast agents. Chelating agents. Metal in neurodegeneration, therapeutic possibilities. Drugs based on gold, silver, mercury, antimony and arsenic.

Recommended reading

- ✓ N. Farrell „Transisiotn metal complexes as drugs and chemotherapeutic agents”
- ✓ M. J. Clarke and P. J. Sadler “Metallopharmaceuticals I and II.”Springer, 1999
- ✓ Prace przeglądowe w Wiadomościach Chemicznych.
- ✓ H. Kozłowski, D. R. Brown and G. Valensin, “Metallochemistry of neurodegeneration.” RSC Publishing, 2006, Cambridge
- ✓ A.Sigel, H. Sigel, R.K.O. Sigel, “Neurodegenerative diseases and metal ions.” Wiley 2006, vol. 1.

Teaching methods: Lecture: 2 hours per week for 15 weeks.

Assessment methods: Lecture credited on the basis of attendance only. Exam for students who selected inorganic drugs as an exam.

Solid-phase organic synthesis

Type of course: elective

Level of course: advanced level – 3rd year of licentiate studies or 1st year of Master's studies

Number of credits allocated, workload based: 1 ECTS

Name of lecturer: Alicja Kluczyk, PhD

Objective of the course: knowledge related to organic synthesis on solid phase, chemical synthesis of biomolecules. Application of solid phase methods in organic and analytical chemistry.

Prerequisites: Organic Chemistry course should be already credited.

Course contents

Strategy of synthesis on solid support. Application and adaptation of classical chemical procedures for solid support, characteristics of solid supports, methods of loading substrates and cleaving products. Polymer-assisted solution phase methods. Immobilized reagents and scavenger resins. Synthesis of biopolymers (peptides, proteins, nucleic acids, PNA and oligosaccharides) and natural products. Organic synthesis on solid phase: condensations, reduction and oxidation, C-C bond formation. Synthesis of heterocycles. Multi-component reactions. Solid support and solid phase synthesis. MAOS – microwave assisted synthesis. Equipment, analytical procedures and purification methods. Applications of solid phase synthesis: biopolymers and natural products, combinatorial libraries, analytical applications.

Recommended reading

- ✓ G. Jung (Ed.), Combinatorial Peptide and Nonpeptide Libraries, VCH, 1996.
- ✓ F. Dörwald, Organic synthesis on solid phase, Wiley 2000.
- ✓ K. Burgess, Solid-phase organic synthesis, Wiley 2000.
- ✓ S. Kates, F. Albericio, Solid-phase synthesis, Dekker 2000.
- ✓ Journal of Combinatorial Chemistry (ACS).
- ✓

Teaching methods: Lecture: 2 hours/week, 8 weeks (combined with Combinatorial Chemistry course)

Assessment methods

The lecture is credited (on the basis of attendance only), for a grade – written semester work (required in case of more than 3 absences).

For students who selected both Solid-Phase Organic Synthesis and Combinatorial Chemistry, there is an option of exam (oral, presentation and discussion of a written work).

Monographic lectures

Molecular photophysics

Type of course: elective (monographic)

Level of course: advanced level - 2nd year of Master studies

Number of credits allocated, workload based: 3 ECTS

Name of lecturer: Anna Szemik-Hojniak, PhD

Objective of the course: The lecture is devoted to photophysical properties of the molecular systems applicable in modern technologies. Students acquire knowledge related to steady state and time-resolved emission of organic compounds and transition metal complexes both in solid and solution phase. Student learns about Photophysics of Excited State Photoinduced Electron (PET) and Proton transfer (ESPT) processes that find their application in so called “advanced or multifunctional materials”, i.e. as molecular devices in electronics, telecommunication, and biotechnology.

Prerequisites: the courses of 1st year of Master’s studies already credited

Course contents

Introductory concepts; Scope of photoinduced proton and electron transfer; Review of photophysical and photochemical principles and definitions; an overview of photophysical and photochemical processes; General features of quenching by proton, electron, and energy transfer. Intermolecular photoinduced electron transfer (PET); The energetics of PET; Photophysical and electrochemical properties of electron transfer donors and acceptors; Energy transfer versus electron transfer; Theories of PET (Marcus, electron tunneling, solvent relaxation); Properties of CT intermediates in PET. The energetics of exciplex and ion-pair formation; Identification of CT intermediates in PET (transient absorption, decay curves-lifetimes, photoconductivity).

Intramolecular photoinduced electron transfer; Through-space and through-bond coupling; Compounds with twisted intramolecular charge transfer (TICT); Bridged metal-ligand systems; Flexible organic systems; Rigid systems; Models for photosynthesis: porphyrin electron- acceptor pair; Supramolecular ET-application in molecular devices; PET in imaging application (holography, xerography, etc).

Single (ESPT) and double excited state proton transfer (ESDPT); 1-aza-carbazol (AC), 7-aza-indol (AI) and their homo-dimers as well as in hetero-dimers with alcohol molecule; Photophysics of tautomerizing systems. Activation of internal conversion by proton transfer and hydrogen bonding; ESIPT in D-A systems with intramolecular hydrogen bonding.

Recommended reading

- ✓ P. Suppan „Chemia i Światło”, Wydawnictwo Naukowe PWN, Warszawa 1997.
- ✓ B. Valeur „Molecular Fluorescence, Principles and Applications”, Wiley-VCH, N.York, 2006.
- ✓ „Inorganic Electronic Structure and Spectroscopy”-vol. 1,2, Ed. I.Solomon and A.B.P. Lever, Wiley, N.York, 1999.
- ✓ „Organic Photochemistry and Photophysics”, Ed. V. Ramamurthy, Kirk S. Schanze, CRC Taylor & Francis, 2006.

Teaching methods: Lecture: 2 hours a week, 15 weeks

Assessment methods

Oral examination from the lectured material - five different issues, 1 h.
Student may pass his exam in Polish or in English language.

Kinetics of electrode reactions

Type of course: elective (monographic)

Level of course: advanced level, 2nd year of Masters studies, also PhD studies

Number of credits allocated, workload based: 1.5 ECTS

Name of lecturer: Professor Maria Grzeszczuk

Objective of the course: basic knowledge in kinetics of electrode reactions, metallic electrodes and semiconductor electrodes

Course contents

Introduction to electrochemical kinetics. Fundamentals – terms, conventions. Electrochemical admittance/impedance concept. Electron transfer at electrodes – parameters, theoretical models. Theoretical predictions and their experimental verifications. Electrical double layer of electrodes and its effect on electrode processes. Electrode processes at semiconductor electrodes. Chemical reactions coupled to electrode reactions. Ion transfer at electrodes. Adsorption on electrodes. Modified electrodes. Digital simulation of electrode processes.

Recommended reading

- ✓ Allen J. Bard and Larry R. Faulkner, “Electrochemical Methods. Fundamentals and Applications.” Wiley, 2001.
- ✓ Southampton Electrochemistry Group, “Instrumental Methods in Electrochemistry”, Ellis Harwood Limited, 1985.
- ✓ Wolfgang Schmickler, “Interfacial Electrochemistry”, Oxford University Press, 1996.
- ✓ John O’M Bockris, Amulya K. N. Reddy, Maria Gamboa-Aldeco, “Modern Electrochemistry 1”, Plenum Press, 1998; “Modern Electrochemistry 2A and 2B”, Kluwer Academic / Plenum Publishers, 2000.

Teaching methods: Lecture: 15 (+3) hours during 9 weeks

Assessment methods

Written exam or written essay providing an advanced description of problems closely related to subjects of the lecture, possibility of an additional oral exam; a list of students who want to pass the exam should be made before beginning of the semester; English as the alternative language for lecturing and examining

Electromagnetic radiation in medical diagnostics

Type of course: elective (monographic)

Level of course: advanced level, 2nd year of Master's studies

Number of credits allocated, workload based: 3 ECTS

Name of lecturer: Professor Eugeniusz Zych

Objective of the course: the goal is to teach the students about the basis of the medical diagnosis taking use of the electromagnetic radiation, mainly X and gamma, the equipment used and the role of chemical materials, detectors and converters of the EM radiation, in the equipment.

Prerequisites: students have to possess at least the basic knowledge on the interaction of electromagnetic radiation with matter and luminescence.

Course contents

Creation of X-rays and gamma-rays, absorption and scattering of the radiation in materials. Radioluminescence and scintillation, equipment used in medical diagnosis on films and with digital recording. Planar imaging, computed tomography, single photon emitting computed tomography (SPECT), positron emitting tomography (PET).

Recommended reading

- ✓ Koziół: Inżynieria chemiczna u progu XXI wieku. "Wiadomości Chemiczne", nr 11-12, 1999
- ✓ H. S. Nalwa, and L. S. Rohwer (ed.) "Handbook of Luminescence, Display Materials and Devices".

Teaching methods: Lecture: 2 hours per week, 15 weeks

Assessment methods

Written exam, exceptionally possible oral correction of the note.
Possible credit without a note on the basis of the lectures attendance.

Structural applications of electron paramagnetic resonance (EPR) spectroscopy

Type of course: elective (monographic)

Level of course: advanced level - 2nd year of Master's studies

Number of credits allocated, workload based: 3 ECTS

Name of lecturer: Professor Adam Jeziarski

Objective of the course: fundamentals and applications of the EPR spectroscopy

Prerequisites: the courses of 1st year of Master's studies already credited

Course contents

Physical basis of the EPR phenomenon. The spin Hamiltonian. Hyperfine interactions – interpretation and structural applications. Theory of the g tensor. Modern EPR spectrometers. Fundamentals of free radical chemistry. Spin label methods; applications in chemistry and biochemistry. Chemistry of reactive free radicals – spin trapping methods. Free radical in atmosphere, hydrosphere, soil and living organisms. Stable free radicals and paramagnetic defects in solids. Application of EPR in coordination chemistry: equilibria, coordination type, chemical bonding character. Modern and advanced applications of EPR: environmental investigations, catalysis, biological systems, EPR in vivo, semiconductors and superconductors, EPR microscopy, EPR dating.

Recommended reading

- ✓ M. C. R. Symons, Spektroskopia EPR w chemii i biochemii, PWN, 1987
- ✓ J. A. Weil, J. R. Bolton, J. E. Wertz, EPR, J. Wiley & Sons, 1994
- ✓ B. Halliwell, J. M. C. Gutteridge, Free Radicals in Biology and Medicine, Oxford Univ. Press, 1999

Teaching methods: Lecture: 2 hours/ week, 15 weeks

Assessment methods: Exam

Through creativity to money. Modern research trends in chemistry

Type of course: elective (monographic)

Level of course: advanced level – 2nd year of Master's studies and PhD studies

Number of credits allocated, workload based: 3 ECTS

Name of lecturer: Professor Jerzy Lisowski

Objective of the course: the lecture presents selected modern research trends in chemistry and illustrates the importance of creativity in the development of applications and technology. The lecture is accompanied by the exercises in English communication – discussion and students own presentation.

Course contents

The lecture encompasses examples from many areas of chemistry: smart contrast agents for medical imaging, molecular machines, sensors, molecular switches, nanotechnology and molecular computers, NO and Viagra story, enantioselective catalysts in pharmaceutical industry, artificial nucleases and antisense technology, optical and magnetic materials.

Teaching methods: 30 h of lecture, including discussions and students short oral presentations

Assessment methods: Oral exam