II. 3.4. COURSES

Course	**CHEMICAL ANALYSIS IN QUALITY SYSTEM**
Lecturer	**PhD. Marija Kaštelan-Macan, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.1.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, seminar report
Knowledge verification	Oral exam

Literature necessary for course

1. M. Kaštelan-Macan, Kemijska analiza u sustavu kvalitete, Školska knjiga, Zagreb 2003.
2. K. Eckschlager, K. Danzer, Information Theory in Analytical Chemistry, John Wiley & Sons, Inc. New York, 1994.
3. R. E. Bechhofer, T. J. Santer, D. M. Goldsman, Design and Analysis of Experiments for Statistical Selection, Screening and Multiple Comparisons, John Wiley & Sons, Inc. New York, 1995.

Course content

Analytical system as a part of information system. Influence of information entropy to the amount and quality of usefull information. Analytical process from theory to analytical signal. Information on chemical proces in laboratory measure. Analytical proces in quality assurance of processes and products.
System approach to chemical analysis. Model. Previous informations. Mathematical relations. Analyte- identity, phase ratio, particle size. Planning and standardizing of analytical system. Experimental subsystem. Chemometry. Experimental design and optimization. Sources and elimination of errors. Influence of mesurement uncertainty to final result and decision .
Validation. Quality assessment of measurement program. Internal assessment- repetition of mesurements, control samples, control charts, exchange of operater and instrumentation. External assessment- collaboartive studies, reference and standard reference materials, audit.

Course	**CHEMISTRY OF WATER**
Lecturer	**PhD. Štefica Cerjan-Stefanović, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.2.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, multimedia
Knowledge verification	Oral exam

Literature necessary for course

1. S. Werner, Aquatic Surface Chemistry, Chemical Process at the Particle -WaterInterface, John Wiley & Sons, Inc., New York, 1987.
2. K. Grasshoff, M. Etrhardt, K. Kremling, Methods of Seawater Analisys, Second, Revised and Extended Edition, Verlag Chemie GmbH, Weinheim, 1993.
3. M. Pinta, Modern Methods for Trace Elements Analisys, Ann Arbor Science Publishers, Collingwood, 1998.

Course content

Water molecule. Structure and properties of water. Hydrogen bound theory, hydratation, hydrolysis. Interaction in water solutions. Acidity and alcality of water. Dissociation CO32-/HCO3-. Puffer systems. Mineral components of water. Diagram of condition. Theory of solubility of oxides and hydroxides of primary constituents of water (Ca^{2+}, Mg^{2+}, Na^{+}, Cl^{-}, SO_4^{2-}), organic carbon, secondary constituents (NH^{4+}, Fe^{3+}, K^{+}, NO^{3-}, F^{-}). Precipitation and dissolution of solid phase. Metal complex. Principe of coagulation, flocculation and precipitation in water treatment. Dissolution of gases. Monitoring of sulphur, nitrogen and phosphor cycles. Division of water in term of chemical properties. General properties of drinking water, industrial water and waste water. Pollutants in water. Sea water. Diagrams of dissolution in sea water. Sampling, analysis of water and data handling. Metal complexes in heterogeneous systems. Automatic and on - line analysis: selection of analizators, analytical sensors cells. Laboratory data bases for analysis of water of different categories.

Course	**WATER TREATMENT PROCESS DESIGN**
Lecturer	**PhD. Laszlo Sipos, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.3.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam, seminar report

Literature necessary for course

1. Stumm, W, Morgan, J. J.: Aquatic Chemistry, Willey Interscience, Third Edition, New York, 1996.
2. Benefield, L. D., Judkins, J. F., Weand, B. L.: Process Chemistry for Water and Waste Water Treatment Processes, Prentice Hall, Inc., New Jersey, 1982.
3. Peavy, H. S., Rowe, D. R., Tchbanoglous, G.: Environmental Engineering, McGaw-Hill, Singapoore, 1987.
4. Advanced Wastewater Treatment: Nutrient Removal and Anaerobic Processes, Ed.: Mudler. A., Pergamon Press, London, 1997.
5. Eckenfelder, W. W., Jr., Industrial Water Pollution Control, 3rd ed., McGraw-Hill, Singapore, 2000.

Course content

Drinking water: definitions and characteristics. Drinking water treatment employing physical, physico-chemical, chemical and biological processes: removal of ammonium, arsenic iron, nitrites, nitrates, humic substances, processes of water stabilization and disinfection. Wastewater: definitions and characteristics. Wastewater collection systems. Wastewater treatment employing: physical, physico-chemical, chemical and biological processes. Advanced wastewater treatment: removal of nitrogen and phosphorus. Sludge treatment and disposal. Evaluation of water treatment processes using pilot-plants and determination of their design parameters. Elements of water and wastewater treatment process design. Collection of design parameters: laboratory and field investigations, pilot-plant studies and scale-up procedures.

Course	**INORGANIC NON-METALLIC MATERIALS**
Lecturer	**PhD. Hrvoje Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.4.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. A. R. West, Solid State Chemistry, John Wiley & Sons Ltd., Chichester, 1994.
2. W. F. Smith, Principles of materials science and engineering 2nd ed. McGraw-Hill Publ. Comp. 1990.
3. J. Brinker, G. W. Scherer, Sol-gel science, Academic Press, London, 1990.
4. J. F. Shackelford, Introduction to materials science and engineers, Macmillan Publ. Comp. New York 1990.
5. E. Hornbogen, Werkstoffe, Aufbau und Eigenschaften von Keramik-, Metall-, Polymer- und Verbundwerkstoffen, Springer Verlag, 7-th ed. 2002.

Course content

Characterization of inorganic materials. Crystalline and glassy state of solids. Crystallization of melts, glasses and gels. Ion exchange reactions and factors influencing the crystal structures. Polycrystalline monophase and multiphase systems. Non-stoichiometry and crystal defects. Solid solutions. Sol-gel techniques. Basic principles. Precursors, preparation of suspensions. Hydrolysis and condensation of alkoxides. Stabilization of sols. Monosized particles and sol-gel processing. Structure of porous gels, xerogels, aerogels. Sintering and recrystallization. Film forming processes. Thin films and coatings, monoliths, powders, fibers and membranes. Surface modification of particles. Inorganic composites. Inorganic-organic composites (ORMOCERS, CERAMERS), nano-composites. Structural characterization of crystalline inorganic materials. Diffraction methods. Microstructure and methods (SEM; TEM; HRTEM; AFM). Spectroscopic methods (MAS-NMR, XPS, ESCA). Characterization methods of amorphous materials. Thermal, electrical, optical, mechanical and chemical properties of inorganic materials and composites.

Course	**HIGH-TEMPERATURE REACTIONS MECHANISMS**
Lecturer	**PhD. Stanislav Kurajica, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.5.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. P. P. Budnikov and A. M. Ginstling, Principles of solid state chemistry - Reactions in solids, MacLarren and Sons, London 1968.
2. J. Šestak, V. Satava and W. W. Wendlandt, The study of heterogeneous processes by thermal analysis, Thermochimica acta, 7 (1973) 333-556.
3. C. H. Bamford and C. F. H. Tipper, Comprehensive chemical kinetics – Reactions in the solid state, Elsevier, Amsterdam, 1980.
4. H. Yanagida, K. Koumoto and M. Miyayama, The chemistry of ceramics, John Willey and Sons, Chichester, 1996.
5. E. Y. Davydov, A. P. Vorotnikov, G. B. Pariyskii and g. E. Zaikov, Kinetic pecularities of solid phase reactions, John Willey and Sons, Chichester, 1998.

Course content

Structure and physicochemical properties of solids: Crystalline state of matter, The crystal latice energy and surface energy, Structure of real crystals, Powdered mixtures. The action of heat on solids: Diffusion in solids, Nucleation and growth, Fusion and heterogeneous equilibria, Polimorphysm, Syntering. Mechanisms of reactions in mixtures of solids: General principles and elementary processes: Role of interphase surface, Role of Gaseous and Liquid phases, Sequence of chemical changes. Thermodynamics of reactions: Phase diagrams. Kinetics of high-temperature reactions: General principles, Processes limiting the rate of chemical reaction, Reactions limited by the rate of diffusion, reactions limited by the rate of interface reaction, Reactions limited by the rate of nucleation and growth. Principles of classifying reactions in crystalline mixture. Influence of principal process conditions on process rate: Grain size, Temperature, Pressure, Accelerators. Methods of high-temperature reactions investigation. Industrial applications of high-temperature reactions: Glass, Ceramics, Cement.

Course	**PHYSICO-CHEMICAL PRINCIPLES IN POLYMER SYSTEMS**
Lecturer	**PhD. Helena Jasna Mencer, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.6.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. M. P. Stevens, Polymer Chemistry, Oxford University Press, 1990.
2. H. G. Barth, J. W. Mays, Modern Methods of Polymer characterization, John Wiley & Sons, New York, 1991.
3. H. G. Elias, Makromoleküle, Hütig & Wepf Verlag, Basel, 1992.
4. A. Tager, Physical Chemistry of Polymers, MIR Publishers, Moscow, 1982.

Course content

Specific features of polymer structures. regularity, heterogeneity. Statistics of linear polymers: dimensions, averages of molecular weights, distribution functions of molecular weights (theoretical, from polymerization kinetics, empirical). Thermodynamics: interactions between polymer and medium, criteria for solubility, solubility parameter concept, polymer chain flexibility, specific features of thermodynamic quantities in polymer systems, phase equilibrium and phase separation, thermodynamic stability. Theories of polymer solutions. Transport processes: polymer particle as a «hydrodynamical particle», diffusion, viscosity. Polymerization kinetics: step-reaction polymerization, chain-reaction polymerization, in homogeneous and heterogeneous systems. Polymer gels: thermally and solvent induced gelation and crystallization. Polymer sorbens and porous polymer structures.

Course	**PHYSICO-CHEMICAL PRINCIPLES IN POLYMER SYSTEMS**
Lecturer	**PhD. Marica Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.6.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. M. P. Stevens, Polymer Chemistry, Oxford University Press, 1990.
2. H. G. Barth, J. W. Mays, Modern Methods of Polymer characterization, John Wiley & Sons, New York, 1991.
3. H. G. Elias, Makromoleküle, Hütig & Wepf Verlag, Basel, 1992.
4. A. Tager, Physical Chemistry of Polymers, MIR Publishers, Moscow, 1982.

Course content

Specific features of polymer structures. regularity, heterogeneity. Statistics of linear polymers: dimensions, averages of molecular weights, distribution functions of molecular weights (theoretical, from polymerization kinetics, empirical). Thermodynamics: interactions between polymer and medium, criteria for solubility, solubility parameter concept, polymer chain flexibility, specific features of thermodynamic quantities in polymer systems, phase equilibrium and phase separation, thermodynamic stability. Theories of polymer solutions. Transport processes: polymer particle as a «hydrodynamical particle», diffusion, viscosity. Polymerization kinetics: step-reaction polymerization, chain-reaction polymerization, in homogeneous and heterogeneous systems. Polymer gels: thermally and solvent induced gelation and crystallization. Polymer sorbens and porous polymer structures.

Course	**RELAXATION PROCESSES IN POLYMERS**
Lecturer	**PhD. Zorica Veksli, full professor**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	12
Course type	Basis 0.7.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. G. Strobl, The Physics of Polymers, Springer-Verlag, Berlin, 1997.
2. T. Kobayashi, Ed., Relaxation in Polymers, World Scientific Publishing Co., Singapore, 1993.
3. D. W. Van Krevelen, Properties of Polymers, Third Rev. Ed., Elsevier, Amsterdam, 1990.
4. R. A. Fava, Ed., Methods of Experimental Physics, Molecular Structure and Dynamics, Accademic Press, N. Y., 1980.
5. V. M. Litvinov and P. De Prajna, Eds., Spectroscopy of Rubbers and Rubbery Materials, Rapra Technology Ltd., Shawbury, UK, 2002.

Course content

Chemical structure and molecular motions: models of molecular motion, conformational characteristics of macromolecules. Phase transitions and relaxation processes: glass transition, theories of glass transition, rubbery state, theory of rubber elasticity, melting; effects of chain structure, molecular mass, crosslinking, additives; amorphous and crystalline polymers.
Relaxation processes below and above the glass transition temperature. Relaxation processes in heterogeneous systems (crosslinked polymers, polymer blends, block copolymers, interpenetrating networks). Dynamics and relaxation processes in liquid crystalline polymers and conjugated polymers. Experimental methods: magnetic resonances (nuclear magnetic resonance, electron spin resonance), infrared spectroscopy, fluorescence, dielectric relaxation.

Course	**HETEROCYCLES IN BIOMOLECULES AND INDUSTRY**
Lecturer	**PhD. Grace Karminski-Zamola, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.8.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. A. F. Pozharskii, A. T. Soldatenkov, A. R. Katritzky, Heterocycles in Life and Society, John Wiley and Sons, Chichester 1997.
2. J. Bergman, H. C. Van der Plas, M. Simonyi, Heterocycles in Bio-Organic Chemistry, The Royal Society of Chemistry 1991.
3. Th. L. Gilchrist, Heterocyclic Chemistry, Longman 1997.
4. T. Eicher, S. Hauptmann, The Chemistry of Heterocycles, Georg Thieme Verlag, Stuttgart 1995.
5. A. R. Katritzky, Handbook of Heterocyclic Chemistry, Pergamon 1986.
6. A. R. Katritzky, Comprehensive Heterocyclic Chemistry, Vol. 1, Pergamon 1984.
7. J. A. Joule, G. F. Smith, Heterocyclic Chemistry, Van Nostrand Reinhold Co. UK 1986.
8. H. Suschitzky, E. F. V. Scriven, "Progress in Heterocyclic Chemistry", Pergamon Press, Vol. 1-2, 1989-1990.
9. G. Vernin, Heterocyclic Flavouring and Aroma Compounds, Ellis Horwood 1982

Course content

About heterocycles in general: Structure characteristic of aromatic hereocyclic systems (pyrols, furans,thiophene, pyridines, qumarines, cromones, diazines, indols, isoindols). Synthesis and phisical features of important bioheterocycles (tetrahydropyran's natural products, benzodiazepinons, indol's and isoquinolon's alkaloids, purin's and pyrimdines bases, heterocyclic amino acids, prolin, histidin, triptophan). Heterocyclic pigments and chlorophyl, hemoglobin-pigment for oxygen transport, antocyans. Hormons.
Application of synthetic heterocyclic compounds as agrochemicals (pesticides, insecticides), in veterinary, heterocyclic polymers (polythiophenes), heterocyclic dyes and pigments, organic conductors, aditivs, aromas and flavors in nutritional and i cosmetic industry. Photographic sensibilisators. Antioxidans and accelerators in vulcanisation.

Course	**PRINCIPLES AND APPLICATION OF ORGANIC PHOTOCHEMISTRY**
Lecturer	**PhD. Marija Šindler, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.9.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, multimedia
Knowledge verification	Written and oral exam

Literature necessary for course

1. A. M. Braun, M. –T. Maurette, E. Oliveros, "Photochemical Technology", John Wiley& Sons, Chichester, 1991.
2. A. Gilbert and J. Baggott, "Essentials of Molecular Photochemistry", Blackwell Science, Oxford 1995.

Course content

Objectives of the course: The study of the principles of photochemistry and the application of photochemical methods to the preparation of organic compounds.
Principles of photochemistry (absorption of light, electronically excited states, absorption spectra, photophysical processes of excited state deactivation, photochemical transformations, quantum yield, electron transfer).
Introduction to photochemical reactions. Electrocyclic reactions. Cycloaddition reactions. Photonitrosylation. Photochlorination. Photobromination. Sulfochlorination. Photooxidation. Photochemical production of vitamins.
Experimental techniques (light sources and filters, photochemical reactors, actinometry).

Course	**STRATEGY OF ORGANIC SYNTHESIS**
Lecturer	**PhD. Mladen Mintas, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.10.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. M. Mintas, S. Raić-Malić, N. Raos, Načela dizajniranja lijekova, HINUS, Zagreb, 2000
2. J. Clayden, N. Greeves, S. Warren, P. Wothers, Organic Chmeistry, Oxford University Press, 2001

Course content

Objectives: To present basics of retrosynthesis (antithesis) of target molecules and to illustrate the application of these principles in rational designing of multistep synthesis of biological and pharmacologically active compounds.
Retrosynthetic analysis (antithesis) of target molecules – synthon approach. Chemical transformation (transform) – as a guide of retrosynthetic approach. Structure based strategies. Function group based strategies. Stereochemical and topological strategies. Multistrategic approach in planning of organic synthesis. Multistep synthesis of biologically and pharmacologically active compounds (antibiotic fumagilline, gilvocarcin M and V, and biotine).
Program of laboratory exercises: Synthesis of compounds with cytostatic and antiviral activities.

Course	**SOLID STATE PHYSICS**
Lecturer	**PhD. Vladimir Dananić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.11.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, sem., lab
Knowledge verification	Written, oral exam

Literature necessary for course

1. C. Kittel: "Introduction to Solid State Physics", John Wiley& Sons.
2. Neil W. Ashcroft and N. David Mermin: "Solid State Physics", Holt, Rinehart and Winston.
3. H. P. Myers: "Introductory Solid State Physics", ^{2}Taylor&Francis
4. Adrian P. Sutton: "Electronic Structure of Materials", Oxford Science Publications.
5. Philip L. Taylor & Olle Heinonen: "A Quantum Approach to Condensed Matter Physics", Cambridge
6. Simon L. Altman: "Band Theory of Solids: An introduction from the point of view of symmetry", Oxford Science Publications

Course content

Basic interactions. Classical and quantum equations of motion; conservation laws. Quantum mechanics. Wave function and wave equation. Examples of quantum-mechanical systems in one dimension; free particle, potential step, potential barrier, square potential well, harmonic oscillator.
Quantum mechanics of a particle in three dimensions. Separation of variables. Central potentials. Quantum mechanical equation for the hydrogen atom. Quantum numbers. Magnetic properties of an atom. Quantum mechanics of a molecule. Theory of chemical bonding.
Classical and quantum statistical physics. Statistical ensembles. Partition function. Thermodynamical potentials. Heat capacity.
Crystal structure of solid materials. Basic concepts of crystalography. Reciprocal lattice. Point groups.
Drude's and Sommerfeld's model of metals. Electron gas. Electrical and thermal conductivity of a metal.
Electrons in a periodic potential. Bloch's theorem. Band structure of the energy spectrum. Insulators, semiconductors and metals. Fermi surface.
Dynamics of a crystal lattice. Phonons and phonon spectrum. Direct and Umklapp processes. Linear response of the system. Dielectric function. Magnetic susceptibility.
Phase transitions in crystal systems. Mean field approximation. Order parameter. Landau expansion of the free energy.
Ferro- and antiferro- magnetic materials. Spin and charge density waves. Supeconducting state. Anomal properties of electric conductivity. Organic conductors.
Basic concepts of liquid crystal theory. Smectic and nematic phases.

Course	**FUNDAMENTALS AND APPLICATIONS OF NANOSTRUCTURES**
Lecturer	**PhD. Krešimir Furić, research professor**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	12
Course type	Basis 0.12.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, seminar, laboratory practice
Knowledge verification	Written, oral exam

Literature necessary for course

1. Prospects in Nanotehnology, Proceedings of the First General Conference on Nanotechnology, Editors M. Krummenacker and J. Lewis, Wiley & Sons, New York / Chichester / Brisbane / Toronto/ Singapore, 1995.
2. Nanostruktured Materials, Editor Carl C. Koch, William Andrew Publishing, Norwich/ New York, 2002.

Course content

Dimensional scale of natural and artificial materials, characterization, aggregate states. Particles, fibers, 2-D and 3-D structures: aggregations and their inversions. Physics and chemistry on the border between classical and quantum theory (sizes of objects, surface effects). Theory of the solid materials: approximations, potentials, vibration calculations, and boundary conditions. Experimental methods, advantages and complementarity: light (classical W source, laser, polarization, fluorescence), confocal, electron (SEM, TEM, HR, ESEM, EDAX) and other microscopes (AF, STEM), vibration spectroscopy (Raman, IR, dispersive, interferometers, inelastic and quasielastic scattering of thermal neutrons, time of flight spectrometer, synchrotron radiation), Auger and Mössbauer spectroscopy. Some methods of preparation and characterization of nanomaterials (particles, films). Special properties: mechanical, physical-chemical, electr.-magn., optical. Selected examples: surface active compounds, storage of hydrogen, semiconductor sensors, porous silicon, nc-Si in matrix, composite nanostructures.
Practicum:
Ph.D. students learn methods of preparation and characterization of nanostructural materials or by *gedanken*-experiments work on their design, in dependence on personal interest. This work can be extended towards the doctoral thesis.

Course	**FUNDAMENTALS AND APPLICATIONS OF NANOSTRUCTURES**
Lecturer	**PhD. Mile Ivanda, senior research associate**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	12
Course type	Basis 0.12.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, seminar, laboratory practice
Knowledge verification	Written, oral exam

Literature necessary for course

1. Prospects in Nanotehnology, Proceedings of the First General Conference on Nanotechnology, Editors M. Krummenacker and J. Lewis, Wiley & Sons, New York / Chichester / Brisbane / Toronto/ Singapore, 1995.
2. Nanostruktured Materials, Editor Carl C. Koch, William Andrew Publishing, Norwich/ New York, 2002.

Course content

Dimensional scale of natural and artificial materials, characterization, aggregate states. Particles, fibers, 2-D and 3-D structures: aggregations and their inversions. Physics and chemistry on the border between classical and quantum theory (sizes of objects, surface effects). Theory of the solid materials: approximations, potentials, vibration calculations, and boundary conditions. Experimental methods, advantages and complementarity: light (classical W source, laser, polarization, fluorescence), confocal, electron (SEM, TEM, HR, ESEM, EDAX) and other microscopes (AF, STEM), vibration spectroscopy (Raman, IR, dispersive, interferometers, inelastic and quasielastic scattering of thermal neutrons, time of flight spectrometer, synchrotron radiation), Auger and Mössbauer spectroscopy. Some methods of preparation and characterization of nanomaterials (particles, films). Special properties: mechanical, physical-chemical, electr.-magn., optical. Selected examples: surface active compounds, storage of hydrogen, semiconductor sensors, porous silicon, nc-Si in matrix, composite nanostructures.
Practicum:
Ph.D. students learn methods of preparation and characterization of nanostructural materials or by *gedanken*-experiments work on their design, in dependence on personal interest. This work can be extended towards the doctoral thesis.

Course	**CHEMICAL AND PHYSICAL PROPERTIES OF SURFACE AND NANOSTRUCTURE**
Lecturer	**PhD. Milorad Milun,**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	12
Course type	Basis 0.13.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, seminar, laboratory practice
Knowledge verification	Written, oral exam

Literature necessary for course

1. Introduction to Surface Chemistry and Catalysis. GA Somorjai - Interscience, New York, 1994
2. Physical Chemistry of Surfaces. AW Adamson, AP Gast - Interscience, New York, 1967
3. Low Energy Electrons and Surface Chemistry. G Ertl, J Kueppers- VCH, Weinheim, 1985
4. Infrared Spectroscopy in Surface Chemistry. ML Hair - Marcell Dekker, New York, 1967
5. Transition Metal Oxides: Surface Chemistry and Catalysis. HH Kung, B Delmon, JT Yates - Studies in Surface Science and Catalysis
6. Introduction to Surface Physics. M Prutton, M Prutton - Clarendon Press, Oxford, 1992
7. B. Gumhalter, M. Milun and K. Wandelt. "Selected Studies of Adsorption on Metal and Semiconductor Surfaces", (Edit.Internat. Buero, KFA Juelich, 1990).
8. Concepts in Surface Physics. MC Desjonqueres, D Spanjaard – Auflage, Springer, Berlin/Heidelberg, 1996
9. B. Gumhalter, M. Milun and K. Wandelt. "Selected Studies of Adsorption on Metal and Semiconductor Surfaces", (Edit.Internat). Buero, KFA Juelich, 1990.

Course content

To provide basic knowledge about a) chemical and physical properties of surfaces, mainly those of metals and semiconductors; b) interactions with adsorbates; c) design and properties of nanostructured systema at surfaces; d) chemical reactions at surfaces and e) surface science experimental methods and techniques.
Monocrystalline surfaces: ideal surface structures, metallic surfaces, fcc, bcc, hcp, thermodynamic values, relaxation, reconstruction, vicinal surfaces, experimental techniques: XRD, HREM, LEED, STM, AFM.
Monocrystalline surfaces: ideal surfaces: electronic structure, periodicity and electronic band concept, band gap, surface states, work function, expermental techniques: HRARPES, AES, XPS, STS.Adsorbate interaction with surfaces, chemisorption, physisorption, adsorption-desorption thermodynamics and kinetics, growth and strucure of layers at well-defined surfaces, clusters, nanoparticles, self-organization at surfaces. LEED, HREED, AES.Solid-vacuum interface, basics of ultrahigh vacuum, why UHV, sticking coefficient, surface coverage, residual gases, mass spectroscopy.
Solid - liquid interface, electrochemical STM and AFM.
Surface science analytical methods: electron spectroscopies (AES, XPS, UPS, ELS), TDS, SIMS, HREELS, FTIR, various microscopies (STM, AFM, MFM, XPM, UPM).
Polycristalline surfaces, naoparticles, catalytic activity, case studies, experimental methods, GISAX. Langmuir isothermes.

Course	**SPECTROSCOPIC METHODS IN THE INVESTIGATIONS OF MATERIALS**
Lecturer	**PhD. Svetozar Musić, research professor**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	12
Course type	Basis 0.14.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. Mössbauer Spectroscopy of Sophisticated Oxides (A. Vértes, Z. Homonnay, Editors), Akademia Kiadó, Budapest, 1997.
2. Y. Ujihra, K. Nomura, Analysis of Corrosion Products of Steels by Conversion Electron Mössbauer Spectrometry, Published by Research Signpost, Trivandrum, India, 1996.
3. M. Thompson, M. D. Baker, A. Christie, J. F. Tyson, Auger Electron Spectroscopy, Wiley & Sons, New York / Chichester / Brisbane / Toronto/ Singapore, 1985.
4. D. H. Whiffen, Spectroscopy, Published by Longman Group Ltd., 1971.
5. D. J. Gardiner, P. R. Graves (Eds.) Practical Raman Spectroscopy Springer-Verlag 1989, Printed in Germany.

Course content

Lectures: General description of the instrumental techniques in the study of materials. Spectroscopic techniques. Background of Mössbauer spectroscopy. Superparamagnetism. Analysis of Mössbauer spectra. FT-IR spectrometer - the principle of work. FT-IR spectra. UV-VIS spectra of metal surfaces modified by: (i) adsorption of different molecules, (ii) inorganic and organic coatings, of corrosion products and protective coatings. Background of Raman spectroscopy. Investigation of electrode reactions by *in situ* Raman spectroscopy. Background of Auger spectroscopy. Selected examples of applications of spectroscopic methods in the investigation of inorganic materials and metal surfaces modified by adsorption of organic molecules, inorganic and organic coatings. Selected examples of the applications of Mössbauer spectroscopy in the investigation of metal corrosion in wet atmosphere, aggressive gasses atmospheres , water and soils. Auger spectroscopy applied in the investigation of atmospheric corrosion of metals, passivation effects and detection of contamination of metal surfaces.
Practice: Laboratory work on the selected spectrometer. Preparation of samples for spectroscopic analysis and obtained spectra analysis (dependent on students interest).

Course	**PRINCIPLES AND PREVENTION OF CORROSION**
Lecturer	**PhD. Mirjana Metikoš-Huković, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.15.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Written and oral exam

Literature necessary for course

1. P. Marcus, J. Oudar (Eds.), Corrosion Mechanisms in Theory and Practice, M. Dekker, N. Y., 1995.
2. B. Jarić, A. Rešetić: Korozija i katodna zaštita. Korexpres, Zagreb, 2003.
3. E. E. Stansbury, R. A. Buchanan. Fundamentals of Electrochemical Corrosion. ASM International, Ohio, 2000.
4. U. Kamachi Mudali, B. Raj. High Nitrogen Steels and Stainless Steels. Alpha Science International Ltd, Pangbourne, UK, 2004.
5. C. Leygraf, T. E. Graedel, Atmosperic Corrosion, John Wiley & Sons, Publisher, 2000.

Course content

Thermodynamics of corrosion reactions. The structure of electryfied phase boundaries. The nature of corrosion reactions, corrosion mechanisms in theory and practice. The rate-potential relationships (Butler-Volmer equation, Bröusted relation). Multistep stationary electrode kinetics. Kinetics of linear potencial change. Determination of the reaction mechanism. Rate determining step. Diagnostic cryteria. Corrosion kinetics in mass transfer. Corrosion kinetics and the environment. The influence of electric, dielectric and structural properties of thin films (organic and oxide) on the corrosion kinetics of metals. The influence of the phase boundary structure on corrosion kinetics. The influence of specific adsorption (anions and organic molecules) on the mechanism of corrosion reactions. Adsorption isotherms. Chemical, electrochemical and strcutural (microstructural) aspects of material stability. Selected examples, experimental techniques (electrochemical techniques, ac techniques, in-situ and ex-situ spectroscopic techniques) and the methodology of corrosion kinetic investigations. The methodology of corrosion protection.
Laboratory: Three to five exercises related to the topics discussed in the lectures.

Course	**ELECTROCHEMISTRY FOR NEW TECHNOLOGIES**
Lecturer	**PhD. Saša Omanović, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.16.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Written, oral exam

Literature necessary for course

1. C. H. Hamann, A. Hamnett, W. Vielstich, Electrochemistry, Willey-VCH., 1998.
2. J. H. Hirschenhofer, D. B. Stauffer, R. R. Engleman and M. G. Klett, Fuel Cell Handbook, U. S. Department of Commerce, 1999.
3. J. Lipkowski, P. N. Ross, Electrocatalysis, Willey-VCH, 1998.
4. J. Wang, Analytical Electrochemistry, 2nd Ed., Willey, 2000.
5. J. M. Thomas, W. J.Thomas, Principles and Practice of Heterogeneous Catalysis, Willey, 1996.

Course content

Brief review of fundamentals of electrochemistry: stoichiometry, ionics, thermodynamics and kinetics; Basics of electrocatalysis: adsorption at solid/liquid interfaces, basic principles of electrocatalysts design; Environmentally acceptable electrochemistry and sustainable energy development; Fuel cells technology: technology overview, thermodynamics; Types of fuel cells: cell components, performance, application; Design of low-temperature fuel cells: hydrogen fuel cell (direct or reformed hydrogen), direct methanol (alcohol) fuel cell; Design of high-temperature fuel cells: solid oxide fuel cell; Fuel cell systems; Bio-fuel cells; Classical water electrolysis; Hydrogen production in PEM generators; Electro-organic synthesis; Wastewater treatment (electrochemical and photoelectrochemical); Interaction of biomolecules with electrically charged surfaces; Development of electrochemical biosensors: enzyme-based electrodes and immunosensors; Electrochemistry in medicine - electrochemical monitoring of disease markers; Development of biomolecule-based electrochemical reactors for bio-electrocatalysis.

Course	**SURFACE ENGINEERING AND NANOSTRUCTURES**
Lecturer	**PhD. Vera Kovačević, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.17.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures and seminar
Knowledge verification	Oral exam

Literature necessary for course

1. R. J. Stokes, D.F. Evans, Fundamentals of Interfacial Engineering, Wiley-VCH, 1997
2. Fundamentals od Adhesion and Interfaces, Eds. D.S, Rimai, L.P. DeMejo, K.L.Mittal, VSP, Utrecht, 1995.
3. G. J. Fleer, M.A. CohenStuart, J.M.H.M. Scheutjens, T. Cosgrove, B. Vincent, Polymers at Interfaces, Chapman & Hall, London, 1993.
4. W. J. Feast, H.S. Munro, Polymer Surfaces and Interfaces, John Wiley & Sons, Chichester, 1987.
5. Polymer Surface Modification: Relevance to Adhesion, Vol. 1,2, Ed. K.L. Mittal, VSP, Utrecht, 1996, 2000.

Course content

Analysis of surfaces phenomena and interfaces. Interfacial interactions at the level of atoms and/or molecules and nanostructured materials. Engineering of surfaces and interfaces. Relation interface/interphase. Adhesion and properties of polymer interfaces on the molecular levels. Adhesion at nanoscale. Chemical and mechanical methods of surface pre-treatment. Surface modifications by irradiation. Relations between the changes of surface properties, interfaces and the materials as a whole. Examples of analysis the processes at the surfaces especially in polymer materials and nanocomposites and in related processing industry.

Course	**SYSTEMS OF ENVIRONMENTAL MANAGEMENT**
Lecturer	**PhD. Natalija Koprivanac, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.18.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, case study
Knowledge verification	Written, oral exam, seminar report

Literature necessary for course

1. Moeller, D. W. : Environmental Health, Harvard University Press, London, 1998.
2. Dupont, R. R. , Baxter, T. E. , Theodore, L. : Environmental Management, Problems and Solutions, Lewis Publishers, New York, 1998.
3. Gregori. S. : Introduction to ISO 14001 Standard, De Montfort University, London, 1996.
4. Sheldon, C. : ISO 14000 and Beyond, Environmental management Systems in the real World, Greenleaf Publishing, UK, 1997.
5. Corbitt, R. A. : Standard Handbook of Environmental Engineering, McGraw-Hill, New York, 1999.

Course content

Sustainable development and concept. Basic principles of Environmental management systems (EMS). Compliance to law, regulation and directives. Important management tools undertaken for different business organization. Implementation of international standards such as: EMS ISO 14001; Quality Management Systems, ISO 9000; Eco – Management and Audit Scheme (EMAS); Occupational Health and Safety Management Systems – OHSAS – 18001. Compliance with legislation. Definition and history of ISO as a body which has typically produced technical standards for industry at other organization. Decision-Making ISO. ISO 14001 structure and methodology and comparison with other standards. Identification of links of broad technical correspondence between ISO 9001 and ISO 14001. Life Cycle Assessment – 14040. Background and implementation EMAS. Bridging ISO 14001 and EMAS. EVABAT (economically viable application of best available technology) concept and continual and improvement. OHSAS 18001 principles and methodology. Cleaner production methodology and Eco-efficiency. Responsible care, demands for chemical industry.

Course	**MATHEMATICAL METHODS IN ENGINEERING CHEMISTRY**
Lecturer	**PhD. Ivica Gusić, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	12
Course type	Basis 0.19.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures, demonstrations
Knowledge verification	Written, oral exam, homework

Literature necessary for course

1. Wikipedia Mathematics, http://en. wikipedia. org/wiki/Mathematics
2. The Mathematical Atlas, A Gateway to Modern Mathematics, http://www. math-atlas. org/welcome. Html
3. Mathematica, http://www. wolfram. com/
4. Math World, http://mathworld. wolfram. com/
5. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, Inc. , 1998.

Course content

Course description: We study the basic concepts of algebra, linear algebra, geometry, analysis (differentiation, integration, ordinary differential equations, partial differential equations), numerical analysis, probability and statistics. We introduce the concept directly, through definitions, and illustrate them by simple examples (or by more sophisticated examples in some cases). After that we connect (some of) the concepts with concret problems in engineering as well as with their solving. Finally, we point out the procedures from Mathematica that are significant in numerical and i symbolic operating with the concepts.

Course	**MATHEMATICAL MODELING**
Lecturer	**PhD. Želimir Kurtanjek, full professor**
Institution	Faculty of Food Technology and Biotechnology , Zagreb
ECTS	12
Course type	Basis 0.20.
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. J. R. Rawlings “Chemical Reactor Analysis and Design Fundamentals”, Nob Hill Publishing Company, Madison, WS, 2002.
2. H. S. Fogler, “Elements of Chemical Reactor Engineering”, Prentice Hall, Upper Saddle River, N. J. , 1999.
3. W. E. Schiesser "Computational Mathematics in Engineering and Applied Science", CRC Press, Boca Ratom, 1994.
4. R. Aris, "Mathematical modelling techniques", Pitman Advanced Publishing, London, 1988.
5. J. D. Seader "Computer Modeling of Chemical Processes", Monograph 15 of Series of American Institute of Chemical Enginers, New York, 1987.
6. J. Villadsen, M. L. Michelsen, " Solution of Differential Equation Models by Polynomial Approximation", Prentice Hall, Englewood Clifs, 1977.

Course content

Objectives of the course: - application of modeling techniques for chemical engineers-numerical methods and software in chemical engineering.
The course provides students of chemical engineering with information on methodologies of mathematical modelling techniques and numerical methods with support of computer software. The course is based on systems view on modelling of chemical engineering processes. Methodological units are:
Fundamentals of systems view and mathematical modelling. Classification of mathematical models. Modern concepts in mathematical modelling. Neural networks. Fuzzy logic modelling. Chemometric models. Expert systems. Steady state models of chemical reacting systems. Multiplicity of stationary states. Numerical methods for stationary models. Methods of Jacobi, Newton, Wegstein, homotopy. Classification of dynamic models. Examples of nonstationary mass and energy balances for chemical reactors. Examples of software for chemical engineers: MatLab, Statistica, W.R. Mathematica, ASPEN, Super Pro-Designer.

Course	**ENERGY AND ENVIRONMENT LOAD**
Lecturer	**PhD. Rajka Budin, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.1. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. J. de Beer. Potential for Industrial Energy-Efficiency Improvement in the Long Term, Kluver Acadenic Publishers, Dordrecht, 2000.
2. T. D. Eastop, D. R. Croft. Energy efficiency. Longman, Essex, 1995.
3. Energy technologies for the 21st century. OECD/IEA, Paris 1997.
4. D. Feretić at al. Elektrane i okoliš. Element Zagreb, 2000.
5. Environmental Engineering and Renewable Energy. Editors Gavasci R., Zandarya S., Pergamon Press 1998.
6. B. Udovičić. Energetika i okoliš u globalizaciji. Kika-graf, Zagreb, 2002.

Course content

Energy demand: adequate, economical, high-grade and environmental friendly. Process energy, environmental impact. Primary sources. conventional, unconventional, availability. Water as energy source. Resources chose in regard to consumers demands. Energy conversion: thermodynamically, economic, ecological aspects. Environmental impact. Efficiencies and improvements. Energy consumption: kind and quality. Parameters relevant for process. Projected and operating values. Plant capacity factor. Optimization: kinds, operations with heat losses. Potential for energy conservatio Waste heats quality and quantity. Existing and new technologies for secondary resources recovery. Heat recuperation. Resources substitution: nonrenewable and renewable. Availability, implementation, economy criterion. Cogeneration. Heat pumps. Thermal and chemical environmental loading. Process examples: Energy structure optimization in intensive industries (chemical, plastic material, paper) and processes (drying, compression, ventilation etc.)

Course	**BIOLOGICAL TREATMENT AND BIOREMEDIATION**
Lecturer	**PhD. Felicita Briški, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.2. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. S. McEldowney, D. J. Hardman, S. Waite, Pollution: Ecology and Biotreatment, Longman Scientific & Technical, Essex, 1993.
2. R. L. Crawford, D. L. Crawford, Bioremediation: Principles and Applications, University Press, Cambridge, 1996.
3. H. J. Rehm, G. Reed, Biotechnology: Environmental Processes I, Wiley_VCH, Weinheim, 1999.

Course content

Physiology of microorganisms, cell structure and function, microbial growth and metabolism. Influence of untreated wastewater on natural recipients and sewage systems. Selection of microorganisms for removal of organic substances and toxic chemicals from domestic and industrial waste streams.
Bioremediation – biodegradative processes (mineralization, transformation or polymerization) for removal or detoxification of pollutants that have found their way into environment (soil, water, sediment). Examples: biological nitrification and denitrification processes in ground water, bioremediation of petroleum contamination, and microbial remediation of heavy metals. Bioremediation processes: aboveground bioreactors, landfarming, composting and *in situ* treatment.

Course	**PHYSICAL-CHEMICAL TREATMENT OF WATER**
Lecturer	**PhD. Krešimir Košutić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.3. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. A. P. Sincero, G. A. Sincero, Physical-Chemical Treatment of Water and Wastewater, CRC Press, New York 2002.
2. W. J. Weber, Physicochemical Processes for Water Quality Control, Wiley-Interscience, New York 1972.
3. J. Mallevialle, PE. Odendaal, M. R. Wiesner(edts.), Water treatment membrane processes, McGraw-Hill, New York 1996.

Course content

Objective of the course: Physical- chemical treatment of potable, industrial and waste water represent a key and irreplaceable phase during water treatment. The objective of this course is learning physical-chemical treatment based on fundamental phenomena.
Water:. Physicochemical properties of water, Components of water, Types of water.
Adsorption: Causes and types of adsorption; Factor influencing adsorption; Adsorption equilibria and adsorption isotherms; Kinetics, rates of adsorption; Batch and continuous – flow systems, The breakthrough curve.
Kogulation and flocculation: Definition; Stability of colloids; Destabilization of colloids, Selection of coagulant; Transport of colloidal particles- perikinetic flocculation, orthokinetic flocculation.
Ion exchange: Synthetic exchange resins; Exchange reactions-exchange equilibria and kinetics of exchange, isotherms, ion selektivity and capacity; Methods of operation-column disign; Applications.
Ozonization- physical and chemical properties of ozone, generation of ozone; advantage and specific application.
Membrane processes: Classification of membranes and membrane operations; Pressure–driven (Δp) operations-reverse osmosis, nanofiltration, ultrafiltration, microfiltration; Module configurations; Membranes-preparation and characterization; Mass Transport and permeat flux and fouling and biofouling in Δp processes, Principles of rejections in Δp processes, mathematical models for solute transport and rejection; Electrodialysis; Membrane bioreactors.

Course	**ION CHROMATOGRAPHY IN ENVIRONMENTAL ANALYSIS**
Lecturer	**PhD. Štefica Cerjan-Stefanović, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.4. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, multimedia
Knowledge verification	Oral exam

Literature necessary for course

1. S. Werner, Aquatic Surface Chemistry, Chemical Process at the Particle -WaterInterface, John Wiley & Sons, Inc., New York, 1987.
2. Colin F. Poole:Chromatography today, Elsevier, Amstrdam-Oxford-New York, 1991
3. J. Weiss Ion Chromatofraphy, VCH, Weinheim, 1995.

Course content

Structure of natural and structure and synthesis of synthetic ion exchangers. Static and dynamic balance of ion exchange. Determination of ions, selective sorption and selective elution. Isothermal ion exchange process. Ion exchange reaction kinetic. Width of chromatographic peak. Mechanism of separation. Stationary phases in column. Mass transfer related calculations. Ion exchange chromatography. Characteristics of chromatogram: retention time, column capacity, selectivity for ions. Different kinds of ion exchange resins. Standardisation. Conducting and UV / VIS detection. Monitoring of nitrogen cycles by ion chromatography. Alkali and earth alkali metals in waters. Toxic metals in ground and water. Organic acids in waters. New stationary phases.

Course	**CHEMICAL WASTE WATER TREATMENT**
Lecturer	**PhD. Marija Kaštelan-Macan, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.5. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Consultations, seminar report
Knowledge verification	Oral exam

Literature necessary for course

1. D. W. Sundstrom, H. E. Klei, Waste Water Treatment, Prentice-Hall, Inc. Engelwood Cliffs, N. J, 1989.
2. W. Stumm, Aquatic Surface Chemistry, John Wiley & Sons, New York, 1997.
3. L. D. Benefield, J. F. Judkins, B. L. Weand, Process Chemistry for Water and Waste Water Treatment, Prentice-Hall, Inc. Englewood Cliffs, N. J. 1992.

Course content

Chemical equations in water system. Equilibrium diagram of carbonates. Alkalinity and acidity. Phosphate equilibrium. Solubility and water softening. Oxidation- reduction equilibria. Kinetics of iron and manganese oxidation with oxygen. Removal of heavy metals from wastewater. Cyanide conversion. Kinetics of disinfection by chlorine and ozone. Equilibrium of nitrogen compounds, Ammonia removal. Treatment of chromium wastewater. Water defluoridation. Impact onto equilibrium system during sampling and sample storage.

Course	**LIQUID CHROMATOGRAPHY**
Lecturer	**PhD. Zvonimir Šoljić, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.6. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. I. M. Hais, K. Macek, Papirova Cchromatografie, Nakl. Českoslov. Akad. Ved. Praha 1959.
2. J. M. Bobbit, Thin-layer Chromatography, Reinhold Co., London, 1963.
3. J. Michal, Inorganic Chromatographic Analysis, Van Nostrand, Reinhold Co.,. London 1973.
4. I. Filipović, P. Sabioncello (ur.), Laboratorijski priručnik, Tehnička knjiga, Zagreb 1978.
5. C. F. Poole, Essence of Chromatography, Elsevier, Amsterdam 2002.
6. J. Sherma, B. Fried (Eds.), Handbook of Thin-layer Chromatography, Dekker, New York 2003.

Course content

Fundamentals of chromatographic methods: Stationary and mobile phases. Chromatographic process. Physical-and chemical features of chromatographic separations.
Planar chromatography:
Thin-layer and paper chromatography. Phisical and chemical sorbent caracteristics. Preparation of thin-layers. Solvent systems, procedures and apparatus. Selection of favourable chromatographic separation conditions. Detection and identification. Possibilities of qualitative analysis. Quantitative analysis and instruments.
High performance liquid chromatography (HPLC):
Fundamentals. Sorbent and solvent systems: liqud-solid and liquid-liquid. Instruments and procedere. Identification of separated components. Quantitative determinations. Application of HPLC.

Course	**CHEMICAL SENSORS**
Lecturer	**PhD. Zorana Grabarić, full professor**
Institution	Faculty of Food Technology and Biotechnology , Zagreb
ECTS	8
Course type	Optional 1.7. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, laboratory demonstrations
Knowledge verification	Oral exam

Literature necessary for course

1. E. E. Edmonds (Ed):"Chemical Sensors", Blackie, Glasgow, 1988.
2. J. Janata:"Principles of Chemical Sensors", Plenum Press, New York, 1989.
3. W. Gőpel, J. Hesse, J. N. Zemel (Eds.):"Sensors-A Comprehensive Survey", Vols. 1 and 2, "Chemical and Biochemical Sensors" W. Gőpel,, T. A. Jones, M. Kleitz, J. Lundstrom, T. Seiyama (Volumes Eds.), VCH, Weinheim, 1991, 1992.
4. Piljac: "Elektroanalitičke metode. Teorijske osnove, mjerne naprave i primjena", RMC, Zagreb, 1995.

Course content

Načela selektivnosti senzora: - kemijska selektivnost (selektivne koordinacije iona i molekula sa krunastim spojevima, kriptandima, sferandima, kaliksarenima itd.); - biokemijska selektivnost (enzimsko, hormonsko i imunokemijsko prepoznavanje); - permselektivnost (membrane i njihova primjena u senzorima); - kemometrčka selektivnost(globalni signali smjese analita i njihovo razdvajanje). Elektrokemijski senzori - potenciometrijski, amperometrijski, voltametrijski i konduktometrijski senzori. Optokemijski senzori - optička vlakna, apsorpcijski, refleksijski i fluorometrijski senzori. Ostali senzori - poluvodički i piezoelektrični senzori. Izabrani primjeri primjene kemijskih senzora u laboratorijskoj industrijskoj praksi te biomedicini.
Vježbe: Izrada i primjena jednog senzora i predaja seminarskog rada.

Course	**BIOSENSORS**
Lecturer	**PhD. Ivana Murković Steinberg, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.8. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	oral, Laboratory demonstrations, Class discussions, Personal projects
Knowledge verification	oral and written (Final report and a presentation of a *personal project*)

Literature necessary for course

1. B. R. Eggins, Chemical Sensors and Biosensors, John Wiley & Sons Ltd., New York, 2002.
2. P. A. Oeberg, T. Togawa, J. Hesse, J. W. Gardner, W. Goepel (Eds), Sensors Applications, John Wiley and Sons Ltd., New York, 2002.
3. O. S. Wolfbeis (Editor), Fiber Optic Chemical Sensors and Biosensors, CRC Press, Boca Raton, 1991, vols. 1&2.
4. N. Hall (Editor), The New Chemistry, Cambridge University Press, Cambridge, 2000.

Course content

Objectives of the course: Understanding basic theoretical concepts and applications of chemical sensors and biosensors. Relevance of sensors to chemical engineers, especially in environmental monitoring and process control. Promote awareness of interdisciplinary technologies in sensor development. Experience of analytical problem solving through preparation of a personal project.
Chemical Sensors and Biosensors – Definitions, Theoretical Aspects, Basic parts of a sensing system. Transduction Elements: Electrochemical, optical, thermal and mass-sensitive transducers. Sensing Elements: Mechanisms of chemical and biological recognition, biomimetic systems, chemical and biological recognition reagents, immobilisation techniques of chemical and biological components, sensor materials, polymers in sensor development. Performance Factors: Selectivity, Sensitivity, Reversibility, Precision, accuracy and repeatability. Electrochemical Sensors and Biosensors: Potentiometric and amperometric sensors and biosensors - ion selective electrodes (ISEs), modified electrodes, thin-film electrodes, microelectrodes, screen printed electrodes; Conductometric sensors and biosensors, Field effect transistor (FET) sensors. Optical Sensors and Biosensors: Techiques of optical detection in sensors, Visible absorption spectroscopy, Fluorescence spectroscopy, Reflection methods, Light scattering techniques, Direct methods, Indicator based sensing, Fiber-optic chemical sensors and biosensors. Mass Sensitive and Thermal Sensors: The piezo-electric effect, Surface acoustic waves, Thermal sensors. Applications: Industrial process control, Environmental monitoring, Healthcare. Fabrication technologies, Novel Sensor Materials and Sensor Platforms and Concepts: Highly Integrated Sensors, Microfluidics, Micro-Electro-Mechanical Systems (MEMS, BioMEMS), Micro-Total-Analytical-Systems (μTAS), Lab-on-a-chip, Nanosensors, Biochips.

Personal Projects: Students will be given a realistic process or enviromental control problem to consider, for which they should devise a feasible solution using the knowledge they gained from the course. Oral presentation of their project work will be given to the rest of the group.

Course	**BIOSENSORS**
Lecturer	**PhD. Stjepan Milardović, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.8. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	oral, Laboratory demonstrations, Class discussions, Personal projects
Knowledge verification	oral and written (Final report and a presentation of a *personal project*)

Literature necessary for course

1. B. R. Eggins, Chemical Sensors and Biosensors, John Wiley & Sons Ltd., New York, 2002.
2. P. A. Oeberg, T. Togawa, J. Hesse, J. W. Gardner, W. Goepel (Eds), Sensors Applications, John Wiley and Sons Ltd., New York, 2002.
3. O. S. Wolfbeis (Editor), Fiber Optic Chemical Sensors and Biosensors, CRC Press, Boca Raton, 1991, vols. 1&2.
4. N. Hall (Editor), The New Chemistry, Cambridge University Press, Cambridge, 2000.

Course content

Objectives of the course: Understanding basic theoretical concepts and applications of chemical sensors and biosensors. Relevance of sensors to chemical engineers, especially in environmental monitoring and process control. Promote awareness of interdisciplinary technologies in sensor development. Experience of analytical problem solving through preparation of a personal project.
Chemical Sensors and Biosensors – Definitions, Theoretical Aspects, Basic parts of a sensing system. Transduction Elements: Electrochemical, optical, thermal and mass-sensitive transducers. Sensing Elements: Mechanisms of chemical and biological recognition, biomimetic systems, chemical and biological recognition reagents, immobilisation techniques of chemical and biological components, sensor materials, polymers in sensor development. Performance Factors: Selectivity, Sensitivity, Reversibility, Precision, accuracy and repeatability. Electrochemical Sensors and Biosensors: Potentiometric and amperometric sensors and biosensors - ion selective electrodes (ISEs), modified electrodes, thin-film electrodes, microelectrodes, screen printed electrodes; Conductometric sensors and biosensors, Field effect transistor (FET) sensors. Optical Sensors and Biosensors: Techiques of optical detection in sensors, Visible absorption spectroscopy, Fluorescence spectroscopy, Reflection methods, Light scattering techniques, Direct methods, Indicator based sensing, Fiber-optic chemical sensors and biosensors. Mass Sensitive and Thermal Sensors: The piezo-electric effect, Surface acoustic waves, Thermal sensors. Applications: Industrial process control, Environmental monitoring, Healthcare. Fabrication technologies, Novel Sensor Materials and Sensor Platforms and Concepts: Highly Integrated Sensors, Microfluidics, Micro-Electro-Mechanical Systems (MEMS, BioMEMS), Micro-Total-Analytical-Systems (μTAS), Lab-on-a-chip, Nanosensors, Biochips.

Personal Projects: Students will be given a realistic process or enviromental control problem to consider, for which they should devise a feasible solution using the knowledge they gained from the course. Oral presentation of their project work will be given to the rest of the group.

Course	**CHROMATOGRAPHIC METHODS IN ENVIRONMENTAI PROTECTION**
Lecturer	**PhD. Sandra Babić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.9. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Consultacion, seminar
Knowledge verification	Oral exam

Literature necessary for course

1. B. Fried, J. Sherma (Eds), Handbook of Thin-Layer Chromatography. Marcel Dekker, New York, 2003.
2. R. M. Smith, Gas and Liquid Chromatography in Analytical Chemistry, John Wiley & Sons, Chichester, 1988.
3. F. W. Fifield, P. J. Haines (Ed), Environmental Analytical Chemistry, Blackie Academic & Professional, London, 1995.

Course content

Theory of chromatographic proces. Chromatographic system. High performance liquid chromatography and thinlayer chromatography. Gas chromatography. Optimization of chromatographic system.
Chromatographic procedure. Sample preparation for chromatographic analysis. Isolation and concentration of analyte from matrix. *On-line* i *off-line* methods for identification and quantification of analyte.
Application of chromatographic methods in environmental protection. Analysis of organic polutants in soil, water and biological material. Analysis of volatile compounds. . Determination of pesticides, chlorinate hydrocarbons, poliaromatic hydrocarbons (PAHs), plychlorinated byphenils (PCBs) and antibiotics. Analysis of inorganic contaminants.
Validation of quantitative chromatographic analysis. Comparison of methods. Limit of detection and limit of quantification. Trace analysis of organic and inorganic emerging contaminants. Chemometric evaluation and optimization of chromatographic parameters.

Course	**MODERN METHODS FOR SAMPLE PREPARATION IN CHROMATOGRAPHY**
Lecturer	**PhD. Alka Horvat, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.10. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, laboratory exercises
Knowledge verification	Oral exam

Literature necessary for course

1. S. C. Moldoveanu, Sample Preparation in Chromatography, Elsevier Amsterdam, 2002.
2. M. Gilar, E. S. P. Bouvier, B. J. Compton, Advances in sample preparation in electromigration, chromatogtaphic and mass spectrometric separation methods, J. Chromatogr. A, 909, 111-135 (2001).
3. J. Sherma, Basic Techniques, Materials, Apparatus, u Handbook of Thin-Layer Chromatography (J. Sherma i B. Fried ur.), 3rd Ed., Marcel Dekker, New York 2003., str. 7-44.
4. C. F. Poole, Essence of Chromatography, Elsevier, Amsterdam 2002.
5. B. E. Richter, B. A. Jones, J. L. Ezzell, N. L. Porter, N. Avdalovic, C. Pohl, Accelerated Solvent Extraction: A Technique for Sample Preparation, Anal. Chem. 68, 1033-1039 (1996).
6. L. A. Berrueta, B. Gallo, F. Vicente, A Review of Solid Phase Extraction: Basic Principles and New Developments, Chromatographia 40, 474-482 (1995).
7. S. K. Poole, T. A. Dean, J. W. Oudsema, C. F. Poole, Sample preparation for chromatographic separations: an overview, Anal. Chim. Acta 236, 3-42 (1990).
8. K. G. Furton and J. Rein, Trends in Techniques for the Extraction of Drugs and Pesticides from Biological Specimens Prior to Chromatographic Separation and Detection (invited review for special issue "Sample Preparation for Chromatographic Analysis"), Anal. Chimica Acta, 236, 99-114 (1990).

Course content

Aim: Explaining to the students preparation of chromatographic samples and presenting modern systems of sample preparation.

Insufficient accuracy and poor repeatability of chromatographic analyses are frequently due to sample preparation. In majority of cases analytical samples are too complex to be analyzed by direct application to the plate or the column, and require further processing by purification and concentration methods. While performing this it must be taken into account that the every procedure, from the very sampling to the analysis, is a potential source of sample contamination.

The procedures comprise: liquid-liquid extraction, column chromatography extraction, solid phase extraction, membranous processes (dialysis and ultrafiltration), distillation and lyophilization. Sometimes salt extraction, deproteinization or derivation may be required as well. Often, the extract has to be concentrated or evaporated to dryness without loss or analyte degradation.

Over past decade there has been an increased use of highly efficient state-of-the-art methods that comprise multiphase preparation e. g. extraction, isolation, deproteinization and sample concentration. These methods are Accelerated Solvent Extraction (ASE), Supercritical Fluid Extraction (SFE) and Solid-phase Extraction (SPE).

Choice of a sample preparation technique and procedure optimization are indispensable prerequisites for successful chromatographic analysis.

Course	**POLLUTION PREVENTION FOR CHEMICAL PROCESSES**
Lecturer	**PhD. Sanja Papić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.11. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. David T. Allen, Kirsten Sinclair Rosselot, Pollution Prevention for Chemical Processes, John Wiley & Sons, New York, 1997.
2. David H. F. Liu, Bela G. Liptak, Environmental Engineers Handbook, Lewis Publishers, New York, 1997.
3. J. H. Clark, Chemistry of Waste Minimization, Blackie Academic & Professional, London, 1995.
4. Sven Erik Jorgensen, Industrial Wastewater Management, Elsevier, Amsterdam, 1979.
5. David T. Allen, David R. Shonnard, Green Engineering, Prentice Hall, New York, 2002.

Course content

Concepts of pollution prevention. Proactive approach. Sources of different types of waste. Distinguishing between recycling and waste treatment. Pollution prevention methodology. Methodology of clenaer production. Responsible care. Assessment phase. Pollution prevention techniques. Process chemistry modifications; flow diagrams, catalysts, batch vs. continuous processes, recovery and recycle of solvents and by products. Unit operations and pollution prevention. Preventing fugitive and secondary emissions. Characteristics of the wastewater from the different industries and key treatment processes that are central to pollution control. Sustainable manufacturing. Case studies from different chemical industries.

Course	**CONTROL OF AIR QUALITY**
Lecturer	**PhD. Vladimira Vađić, senior scientist**
Institution	IMI, Zagreb
ECTS	8
Course type	Optional 1.12. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures,laboratory demonstrations
Knowledge verification	Oral exam

Literature necessary for course

1. A. C. Stern: Air Pollution - Volume I-V. Academic Press New York, San Francisco, London, 1977.
2. Branka Penzar: Meteorologija za korisnike. Školska knjiga, 1996.
3. Guidelines for Air Quality WHO 2000 http://www. who. int/peh/

Course content

The aim of this course is to make the students acquainted with issues and difficulties related to air quality management, which requires a scientific approach. Air quality monitoring requires new methods for the analysis of polluted air and an overall harmonisation of monitoring networks. Strategic decisions for the improvement of air quality should be based on these measurements and on the principle of sustained development.
Air pollution sources and their relationship with the development and use of fuels will be studied, also the behaviour of pollutants in the air, their physical and chemical transformation, cyclic changes (daily, weekly, yearly cycles). Air quality surveillance, approach, sampling, measuring, processing will be analysed with the given interpretation of findings with respect to limit values. Evaluation of air quality and categorisation according to regulations with air protection and improvement strategies will be studied.

Course	**VOLTAMMETRIC METHODS OF ANALYSIS OF METALS AND ORGANIC MATTER IN THE ENVIRONMENT**
Lecturer	**PhD. Božena Ćosović, senior scientist**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 1.13. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, laboratory work
Knowledge verification	Seminar report

Literature necessary for course

1. A. M. Bond, Modern Polarographic Methods in Analytical Chemistry, Marcel Dekker, New York and Basel, 1980.
2. J. Wang, Stripping Analysis: Principles, Instrumentation and Applications, VCH, Deerfield Beach, FL, 1985.
3. I. Piljac, Elektroanalitičke metode: Teorijske osnove, mjerne naprave i primjena, RMC, Zagreb, 1996.
4. F. Scholz (ur.), Electroanalytical Methods: Guide to Experiments and Applications, Springer, Berlin, 2002.

Course content

Basic principles of polarographic (direct current and alternating current polarography, square wave and pulse polarography) and voltammetric (linear sweep, cyclic and stripping voltammetry) analytical techniques. Faradaic and nonfaradaic processes at electrodes. Diffusion and kinetically controlled electrochemical processes. Reversible, quasireversible and irreversible electrode processes. Pseudopolarography and its application in trace metal speciation. Complexing capacity determination. Adsorption phenomena on electrodes. Determination and characterization of organic surface active substances: natural and synthetic surface active substances. Formation of insoluble salts and complexes with the mercury electrode. Speciation of sulfur species by electrochemical methods.
Application of electrochemical methods in water quality analysis and pollution control in the environment.

Laboratory work: Voltammetric determination of trace metals. Adsorption of Triton-X-100 and determination of surface active substances. Analysis of elemetal sulfur, sulfide and sulfite in aqueos solutions.

Course	**WASTE MANAGEMENT OF CHEMICAL INDUSTRY**
Lecturer	**PhD. Natalija Koprivanac, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 1.14. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, consultations, case study
Knowledge verification	Written, oral, seminar report

Literature necessary for course

1. Crittenden, B., Kolaczkowski, S.: Waste Minimization; A Practical Guide, Institution of Chemical Engineers, Rugby, Warwickshire, UK, 1995.
2. Clark, J. H.: Chemistry of Waste Minimization, Blackie Academic & Professional, London, 1995.
3. Allen, D. T., Rosselot, K. S.: Pollution Prevention for Chemical Processes, John Wiley & Sons, Inc., New York, 1997.
4. Cornwell, D.: Introduction to Environmental Engineering, McGrawHill, Singapore, 1998.
5. Suri, P. S., Christensen, G. L.: Hazardous and Industrial Wastes, Technomic Publishing Co. Inc., Lancaster, 1998.

Course content

Different types of chemical industry wastes, (hazardous, inert, municipal). Legislation and regulative. Emissions in air water and soil. Sources of solid and hazardous waste. Treatment and management of waste by concept of international law and the best world practice. Analytical method of different waste types concerning to waste treatment. Waste minimization as component of sustainable development concept. Waste estimation at the key points in process units of chemical industry. Cleaner production methodology application. Life Cycle Assessment as tool for recognition of product impacts to environment during product life cycle. Chemical industry product's effects to environment. "Case studies", particularly in organic chemical industry as examples of waste management treatment method (recycling, incineration, disposal). Remediation technologies. Design of disposals for sludges, solid and hazardous waste.

Course	**PROVIDING OF CHEMICALS AND PREVENTING ACCIDENTS**
Lecturer	**PhD. Franjo Plavšić, full professor**
Institution	Croatian National Institute of Toxicology, Zagreb
ECTS	8
Course type	Optional 1.15. Quality of Environment Processes and Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. Robinson W.D., The Solid Waste Handbook, John Wiley & Sons. New York-Chichester-Brisbane-Toronto-Singapore. 1986.
2. Plavšić F., Stavljenić A., Vrhovac B., Osnove kliničke farmakokinetike. Školska Knjiga, Zagreb 1992.
3. Plavšić F., Wolf-Čoporda A., Lovrić Z., Capak K., Osnove toksikologije. O-tisak, Zagreb 2001.
4. Duraković i sur., Klinička toksikologija. Grafos, Zagreb 2000.
5. Plavšić F., Lovrić Z., Wolf-Čoporda A., Neke zakonske obveze osoba koje rade s otrovima. O-tisak, Zagreb, 2003.
6. Plavšić F., Interventni planovi. spremno za tisak.

Course content

The main aim of the course is the training for prevention of chemical accidents. The second part is related to the disposition of dangereous waste and remediation of the environment contaminated by chemical accidents. In the prevention of accidents the first thing is to be aware of dangers, then to estimate the risk in the plant and out of it, to make the procedures for informing and communication, to predict the procedures for intervention, to organize the education and training of workers for the accidents, to check written procedures, to plan the situation normalization, remediation and completition of intervention plan. The course will include the classification of the substances and products according to the danger for human health and environment based on adequate EU directives, so being aware of the dangers would be close to the audience. The methods for risk assessment based on the type and level of danger from the substances and products will be worked out in detail, the same as computer simulations of crisis events in expecting and worst possible cases. The special attention will be given to the quantities of dangereous substances and their physical, chemical (e.g. the difference between gaseous, liquid and solid products) and toxicological characteristics. In the last decades the incidence of CMR effects (carcinonogenicity**,** mutagenicity and reproductive toxicity), oversensitiveness and alergogenic reactions is disturbingly increasing because of more than 100 000 insufficiently studied chemicals and at least ten times more their products present on EU market. The course will make the audience ready for the new European REACH system (Registration, Evaluation and Authorisation of Chemicals) which will be relevant from January 1st 2006. The special attention will be given to the care for the waste of dangerous substances and remediation of the environment contaminated with dangerous substances because of the chemical accidents or increased emissions of contaminants to the environment. Examples from Croatia and the world will be given. The special attention will also be given to the choice of methods and technologies for waste disposition and remediation so they will be the minimal danger for human health and the environment.

Course	**CHEMISTRY OF NONNUCLEOSIDE ANTINEOPLASTICS**
Lecturer	**PhD. Grace Karminski-Zamola, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 2.1. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. D. A. Williams, T. L. Lemke, W. O. Foye “Foye’s Principles of Medicinal Chemistry”, Lippincott Williams & Wilkins Publishers, Canada, UK, Germany, France, 2002.
2. G. L. Patrick «An Introduction to Medicinal Chemistry», Oxford University Press, NY, 2001.
3. G. Thomas “ Medicinal Chemistry, an Introduction" John Wiley and Sons Ltd, NY, 2000.
4. D. Lednicer, “Strategies for Organic Drug Synthesis and Design”John Wiley and Sons Inc. NY 1998.
5. P. Krogsgaard- Larsen and H. Bundsgaard "A Textbook of Drug Design and Development”, Harwood, Academic Publishers GmbH, Chur Switzerland 1994.
6. R. B. Silverman ”The Organic Chemistry of Drug Design and Drug Action”, Academic Press Inc. San Diego 2003.

Course content

Drugs which directly intercalate with DNA. Alkylating agents, metal complexes binding to DNA. Intercalating compounds, special examples; amasacrin and dactinomycin. Minor groove binder; heterocyclic amidines and bisamidines. Antracyclic antitumor antibiotics; doxorubicin, daunomycin, zinostatin. Condensed heterocyclic quinolones and their antitumor activity. Synthesis of anraqinone antineoplastic agents; amantatrone, mitoxantrone and other. Synthesis of antineoplastic with six membered heterocyclic nulei. Antineoplastic with steroid structure. Amid's antineoplastics, benzothiazole's antineoplastics. Mechanism of action.

Course	**ORGANIC CHEMISTRY INTEGRAL APPROACH**
Lecturer	**PhD. Marija Šindler, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 2.2. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, seminar
Knowledge verification	Oral exam

Literature necessary for course

1. G. Denis Meakins, «Functional Groups. Characteristics and Interconversion», Oxford University Press, Oxford, 1996.
2. F. Serratosa,. Organic Chemistry in Action. The Design of Organic Synthesis., Elsevier, Amsterdam, 1990.
3. T. M. Kitson,. Organic Chemistry. A Guide to Common Themes, Edward Arnold Publ., London, 1988.
4. J. Clayden, N. Greeves, S. Warren, P. Wothers «Organic Chemistry» Oxford University Press, 2001
5. G. Marc Loudon «Organic Chemistry», Oxford University Press, Oxford, 2002.

Course content

Carbocations: Structure, stabilisation, reactions and rearrangement. Carbanions: Simple ions. Alkinides, carbanions resonance stabilized, carbanions and keto-enol tauthomerism, reactions of carbanions. Free radicals: Genesis, structure, reactions. Electrophiles; Electrophilic additions, electrophilic aromatic substitutions, relative reactivity of electrophiles, halogenation of aldehides and ketons. Reactions of nucleophiles. Attac of nucleophiles on carbocation, saturated carbon and carbonyl carbon in functional derivatives of carboxylic acids, aldehides and ketons. Nucleophiles and unsaturated carbonyl compounds. Nucleophilic aromatic substitution. Nitrosation of amines. Construction of C-C bond. Free radical's making of C-C bond. Nuleophile attack on carbocations, alkilhalides, karbolyl compounds and carbenes. Diels-Alder reaction. Carboxylic acids and bases. Relative strenth and structure, equilibrium, duble ions and amino acids. Leaving groups. Their importance in the reaction with saturated compounds, acyl compounds. Inducive effect. Effects of alkyl groups and halogens on negative and positive centers. Resonance. resonance and acidity of oxigen, carbon and nitrogen acids. Resonance and basicity. Resonance and aromaticity. Example of stabilisation of ions, neutral molecules by resonance. Resonance by electrophilic and nucleophilic reactions. Stereochemistry. Free radical halogenation of chiral compounds. Stereochemistry of nucleophilic substitution. Stereochemistry of elimination. Sin- and anti-addition reaction on different unsaturated bonds.

Course	**PRINCIPLES AND APPLICATION OF NMR SPECTROSCOPY**
Lecturer	**PhD. Predrag Novak, associate professor**
Institution	Pliva, Zagreb
ECTS	8
Course type	Optional 2.3. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, seminar
Knowledge verification	Oral exam

Literature necessary for course

1. H. Friebolin, "Basic One- and Two-Dimensional NMR Spectroscopy, VCH, Weinheim", 1998.
2. T. D. W. Claridge, "High Resolution NMR Techniques in Organic Chemistry", Pergamon, Amsterdam, 1999.
3. O. Zerbe, Ed. "BioNMR in Drug Research. Methods and Principles in Medicinal Chemistry." Wiley-VCH, Weinheim, 2003.
4. S. Berger, S. Braun, "200 and More NMR Experiments: A Practical Course", Wiley-VCH, Weinheim, 2004.
5. R.M. Silverstein, F.X. Webster, Spectrometric Identification of Organic Compounds, Wiley, New York, 1997.
6. P. Novak, D. Vikić-Topić, V. Smrečki i Z. Meić, "Isotope Effects in NMR Spectra as a Structural Tool for Organic Molecules" u *New Advances in Analitycal Chemistry*, Prvi dio, poglavlje 4, ed. Atta-ur-Rahman, Gordon and Breach Science Publisher, Amsterdam, 2000.

Course content

Principles of nuclear magnetic resonance. Nuclear spin and resonance. Vector model of NMR. Basic NMR parameters: chemical shift, scalar and dipolar coupling, relaxation times. Time and frequency domain. NMR spectrometers. Spin systems. One-dimensional multi-pulse techniques: APT, INEPT, DEPT, PENDANT. Two-dimensional correlation techniques: COSY, DQCOSY, TOCSY, HMQC, HSQC, HSQC-TOCSY, HMBC. Spectral editing. Selective experiments. Nuclear Overhauser effect and its application: NOESY, ROESY, trNOESY. Application of NMR techniques in determinig 2D structures of organic and biomolecules. NMR in conformational analysis. Modern NMR techniques for monitoring ligand-receptor interactions. Use of hyphenated LC-NMR technique in on-line analysis of compound mixtures. Solid state NMR: magic angle spinning and cross-polarization, CP MAS NMR. Application of NMR in polimorph analysis. The role of NMR techniques in modern pharamaceutical, oil and food industry.

Course	**PROCESSES OF ELECTROORGANIC SYNTHESIS**
Lecturer	**PhD. Ljerka Duić, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 2.4. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and multimedial
Knowledge verification	Oral exam

Literature necessary for course

1. M. H. Baizer, Organic Electrochemistry, Marcel Dekker, Inc. , N. Y. (1974).
2. M. R. Rifi, F. H. Covitz, Introduction to Organic Electrochemisty, Marcel Dekker, Inc. , N. Y. (1974).
3. S. Torri, Electroorganic Synthesis, Kodansha VCH, Tokyo (1985).
4. A. J. Fry, Synthetic Organic Electrochemisty, John Wiley and Sons, Inc. , N. Y. (1989).
5. H. Lund, O. Hamerich, Organic Electrochemistry, Marcel Dekker, Inc. (2001).

Course content

Introduction: fundamental electrode phenomena, electrical double layer, electrode potential, adsorption, electrode kinects, mass transport, limiting currents. Methods of studying electrode reactions: coulometry, polarography, voltammetry, chronopotentiometry, correlation between the methods, choice of the suitable method. Realisation problems: rectors (cells), reactor divider, electrode material, the role of solvents, the role of electrolytes etc. Synthetic and mechanistic aspects of electrode reactions. Cathodic reactions: generation of radical-anions, reactions of radical-anions, generation and reactions of dianions, reduction of carbonium ions, reduction of halides, nitro compounds, carbonyl compounds, carboxylic acids and their derivatives. Anodic reactions: oxidation of hydrocarbons, carboxylic acids, amines, oxygen containing substances, sulphur containing substances. Electrochemistry of some special compounds: electrolysis of heterocyclic compounds, synthesis of organometallic compounds. Classification of electrode reactions according to the type of the reaction and product and electrochemical reaction classification. Indirect electrochemical synthesis (IES). IES with metal redox systems, IES with non-metallic redox systems. IES with organic redox systems.

Course	**DESIGN AND BIOLOGICAL MECHANISM OF ACTION OF ORGANIC SYNTHETIC DRUGS**
Lecturer	**PhD. Mladen Mintas, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 2.5. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and multimedial
Knowledge verification	Oral exam

Literature necessary for course

1. M. Mintas, S. Raić-Malić, N. Raos, Načela dizajniranja lijekova, HINUS, Zagreb, 2000.
2. N. Raos, S. Raić-Malić, M. Mintas, Lijekovi u prostoru: farmakofori i receptori, Školska knjiga, Zagreb, 2005, in press.
3. J. Saunders, Top drugs: Top synthetic routes, Oxford University Press, Oxford 2000.
4. D. Lednicer, Strategies for organic drug synthesis and design, J. Wiley & sons, New York, 1998.

Course content

Objectives: To present principles of organic synthetic drug design and biological mechanism of their action. This will be illustrated by examples of the antiviral, anticancer drugs, as well as drugs against gastrointestinal, cardiovascular, inflammatory and central nervous system diseases.
General: Receptors. Drug and receptor interaction. Methods of new drugs discovery. Rational approach of drug development on the basis of their targets of action. Molecular mechanisms of drug action (physical-chemical and stereochemical aspects). Biotransformation of drugs. Prodrugs.

Examples: 1. Inhibitors of angiotensin converting enzyme as effective antihypertinsive agents (captopril, benazepril, ramipril). 2. Modulation of central serotonin in the treatment of depression (fluoxetine, sertraline and paroxetine). 3. Proton pump inhibitors as gastric acid secretion inhibitors (omeprazole, lansoprazole). 4. Hypnotic, anxiolytic, anticonvulsant and muscle relaxant agents: ligands for benzodiazepine receptors (diazepam, alprazolam, flumezamil). 5. Blockers of the H_1 receptor for the treatment of seasonal allergic rhinitis (loratidine, cetirizine, astemizole). 6. Nucleoside analogues – inhibitors of HIV-reverse transkriptase – drugs against AIDS (zidovudine, lamivudine). Antitumor drugs: alkylating agents (klorambucil, nitrogen mustard – mekloretamine, triethylenemelamine); antimetabolits: folic acid antagonist (methotrexate); purine antagonists (6-mercaptopurine); pirimidine antagonists (5-fluoruracil); carcinolytic antibiotics (actynomicin D); anthracyclines (daunorubicine), mitotic inhibitors (colchicine); hormonal agents (antiestrogens).
Program of laboratory exercises: Synthesis of compounds with antiviral and antitumor activities. Separation of products and determination of their structures by ^{1}H and ^{13}C NMR spectroscopy and mass spectrometry

Course	**STEREOCHEMISTRY AND DRUG ACTION**
Lecturer	**PhD. Silvana Raić-Malić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 2.6. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and multimedial
Knowledge verification	Oral exam

Literature necessary for course

1. N. Raos, S. Raić-Malić i M. Mintas, Lijekovi u prostoru: farmakofori i receptori, Školska knjiga, Zagreb, 2005, in press.
2. M. Mintas, S. Raić-Malić, N. Raos, Načela dizajniranja lijekova, HINUS, Zagreb, 2000**.**
3. H. J. Roth, C. E. Müller i G. Folkers, Stereochemie & Arzneistoffe, Wissenschaftliche Verlagsgesellscharft mbH, Stuttgart, 1993.
4. E. L. Eliel, S. H. Wilen, M. P. Doyle, Basic Organic Stereochemistry, John Wiley & Sons, Inc., New York, 2001.
5. L. P. Graham, An Introduction to Medicinal Chemistry, Oxford University Press, New York, USA, 2001; G. Thomas, Medicinal Chemistry, An Introduction, John Wiley & Sons, Ltd., England, 2000.
6. C. A. Challenger, Chiral Drugs, Gower Publishing, Ltd., England, 2001.

Course content

Objectives: To present principles of organic synthetic drug design and biological mechanism of their action. This will be illustrated by examples of the antiviral, anticancer drugs, as well as drugs against gastrointestinal, cardiovascular, inflammatory and central nervous system diseases.
General: Receptors. Drug and receptor interaction. Methods of new drugs discovery. Rational approach of drug development on the basis of their targets of action. Molecular mechanisms of drug action (physical-chemical and stereochemical aspects). Biotransformation of drugs. Prodrugs.
Examples: 1. Inhibitors of angiotensin converting enzyme as effective antihypertinsive agents (captopril, benazepril, ramipril). 2. Modulation of central serotonin in the treatment of depression (fluoxetine, sertraline and paroxetine). 3. Proton pump inhibitors as gastric acid secretion inhibitors (omeprazole, lansoprazole). 4. Hypnotic, anxiolytic, anticonvulsant and muscle relaxant agents: ligands for benzodiazepine receptors (diazepam, alprazolam, flumezamil). 5. Blockers of the H_1 receptor for the treatment of seasonal allergic rhinitis (loratidine, cetirizine, astemizole). 6. Nucleoside analogues – inhibitors of HIV-reverse transkriptase – drugs against AIDS (zidovudine, lamivudine). Antitumor drugs: alkylating agents (klorambucil, nitrogen mustard – mekloretamine, triethylenemelamine); antimetabolits: folic acid antagonist (methotrexate); purine antagonists (6-mercaptopurine); pirimidine antagonists (5-fluoruracil); carcinolytic antibiotics (actynomicin D); anthracyclines (daunorubicine), mitotic inhibitors (colchicine); hormonal agents (antiestrogens).
Program of laboratory exercises: Synthesis of compounds with antiviral and antitumor activities. Separation of products and determination of their structures by ^{1}H and ^{13}C NMR spectroscopy and mass spectrometry.

Course	**ISOLATION AND APPLICATION OF NATURAL ORGANIC COMPOUNDS**
Lecturer	**PhD. Nikola Blažević, senior scientist**
Institution	Faculty of Pharmacy and Biochemistry, Zagreb
ECTS	8
Course type	Optional 2.7. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Seminar

Literature necessary for course

1. Scientific and other papers published in last 10 years and actual procedures developed by author.

Course content

Introduction: General knowledge about natural compounds and their application 1 hour
Methods of isolation of natural compounds – theoretical backgrounds and tehnological procedures
Different distillation procedures (atmospheric and low pressure, steam – distillation, rectification and cohobation)
Extractions using different solvents (maceration, percolation, diacolation, evacolation), extraction using carbon dioxide
Chromatographic methods applied in isolation and controle of natural compounds
Isolation of different volatile components (essential oils, flavors, resins)
Isolation and purification of different alcaloids, vitamins, hormons, polysacharides, flavonoids, saponines and natural colourants (depends on the interest of students)
Industrial application of isolated natural compounds and their mixtures
Application in pharmaceutical (phytotherapy), food (flavors, spices, additives), feed (flavors), cosmetic (fragrances, cosmeticeuticals, active ingredients, colourants) industry.
Practical laboratory work : isolation of essential oils and plant extracts, compounding of fragrances and flavors

Course	**CHEMICAL DEVELOPMENT AND SCALE-UP IN DRUGS INDUSTRY**
Lecturer	**PhD. Miljenko Dumić, associate professor**
Institution	Pliva, Zagreb
ECTS	8
Course type	Optional 2.8. Organic Synthetic Products
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. B: Spilker, Multinational Drug Companies. Principles and Practics, Raven Press, New York 1994.
2. N. G. Anderson (Ed.), Practical Process Research and Development, Academic Press, San Diego, 2000.
3. K. G. Gadamasetti (Ed.), Process Chemistry in the Pharmaceutical Industry, Marcel Dekker, New York, 1999.
4. M. E. Wolff (Ed.), Bürger's Medicinal Chemistry and Drug Discovery, Fifth Ed. , Vol. 1-5, Wiley Interscience, New York, 1995-1997.

Course content

Objectives of the course: To familiarize graduates with overall picture of drug industries as well as drug discovery, development, and manufacture principles, processes and rules.
Drugs industry and its environment (Drug, Pharmaceutical industry and its environment, Market trends, Pharmacoeconomics, Mergers, joint ventures and alliances, From idea to new drug, Evaluation and selection of projects), Basic research (Medicinal chemistry, . Lead. - leader compound, Target identification and team formation, Where do ideas for lead structures come from?, Operative strategy for leader development, Leader optimizing by less drastic and less empirical methods, Advanced approaches to drug design). Industrial property protection (Intellectual property, Patents: purpose, what, why, when, and where to patent?, Basic concepts in patenting, Elements of patent, Patenting procedure or how to fight out patent?) and Developmental research (Physicochemical characterization of Active Pharmaceutical Ingredient, Synthetic route discovery and selection, Choice and sourcing of raw materials, Cost calculation, Development and optimization, Process optimization using statistical methods, Solvent effects in organic synthesis, Importance of chemical-engineering principles, Importance of work up, Crystallization and polymorphism, Scale-up, Hazards at API development and scale-up, Analytical issues at API development and scale-up, Effluent control, Chiral drugs and their production).

Course	**ELECTRICALLY CONDUCTIVE POLYMERS**
Lecturer	**PhD. Ljerka Duić, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.1. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures or consulting
Knowledge verification	Oral exam

Literature necessary for course

1. S. Roth, "One-Dimensional Metals", VCH, Weinheim, (1971).
2. G.P. Evans, "The Electrochemistry of Conducting Polymers", Ch 1 in "Advances in Electrochemical Science and Engineering", VCH, Weinheim, (1990).
3. L. Alacer, "Conducting Polymers", D. Reidel Publishing Company, Dordrecht, (1987).
4. G. G. Wallace et. al. "Conductive Electroactive Polymers", CRC Press, (2003).

Course content

A comparison of conventional polymers and conductive polymers (CP), molecular structure, range of conductivity. Conductivity: The origin of CP conductivity, the nature of charge carriers, conjugation defects, creation of defects known as soliton, creation of polarons and bipolarons, creation of energy levels within the forbidden energy gap, bipolaronic band. Total conductance as a function of conductivity along and across the chains, the meaning of hopping conductivity. Conducting polymers as anizotropic synthetic metals.
Typical conductive polymers: Polyacetilene as model CP, electronic structure as basis for the topological defects. Synthesis, doping, stability. Polyparaphenylene: conductivity type, doping, stability. Polypyrrolle: electronic structure and conductivity, synthesis, morphology and structure. Polyaniline: electronic structure and conductivity, synthesis, morphology, structure. Application s of CP: Electrode material for primary and secondary batteries. Description of commercially available batteries, construction and the mode of operating. Other possible applications: corrosion protection, sensors, transistors, modified electrodes, catalysts etc.
Laboratory: Electrochemical synthesis of a conductive polymer (by cyclic voltammetry, FKIT). Preparation of the CP modified electrode (FKIT). Application of the CP modified electrode.

Course	**CHEMISTRY AND TECHNOLOGY OF MEMBRANES**
Lecturer	**Dr.sc. Branko Kunst, prof. emeritus**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.2. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. R. Kesting, Synthetic Polymeric Membranes, Wiley-Interscience, New York 1985.
2. D.R.Lloyd, Material Science of Synthetic Membranes, A.C.S., Washington 1985.
3. L.J.Zeman, A.L.Zydney, Microfiltration and Ultrafilatration, M.Dekker, New York 1996.
4. K.Scott, Handbook of Industrial Membranes, Elsevier Science Publ., Oxford 1995.
5. M.C.Porter, Handbook of Industrial Membrane Technology, Noyes Publications, Park Ridge, N.J. USA 1990.

Course content

Membranes are thin porous physical barriers that have recently been used for separation, purification, concentration and fractionation of liquid mixtures. Structure and properties of membranes are governed by demands of a separation process and can be controlled by the preparation conditions. Correlations among the preparation methods, membrane structure and properties are considered in this curriculum.
SHORT PROGRAM Membranes, their properties and types. Structure of membranes, preparation methods. Mass transport across the membrane. Membrane separations caused by the pressure gradient. Effect of chemical, electrochemical and temperature gradients. Technical application of the separation membranes. Membrane processes: reverse osmosis, nanofiltration, ultrafiltration, microfiltration. Dialysis and electrodialysis.

Course	**COMPOSITE MATERIALS**
Lecturer	**PhD. Marica Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.3. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures or seminar
Knowledge verification	Oral exam

Literature necessary for course

1. I.S.Miles and S.Rostami, Eds., Multicomponent Polymer System, Longman Scientific & Technical, Bath Press, Avon, 1992.
2. R.W. Dyson, Ed., Engineering polymers, Blackie, Glasgow and London, 1990.
3. P.C.Powel,Ed., Engineering with Polymers, Chapman and Hall, New York, 1993.

Course content

Polymer matrix composites. Matrices, fillers/reinforcements. Interface and interphase: in composites. Characterization of interface. Modification of interface. Thermoset matrices of composites.Physico-chemical characteristics of curing process. Kinetics and chemorheology of curing. TTT-diagrams. Processing of polymer composites. Polymer nanocomposites. Nano-reinforcements: layered silicates. Organic-inorganic hybrids: synthesis, sol-gel process.

Course	**QUALITY OF ADHESION OF THIN FILMS AND COATINGS**
Lecturer	**PhD. Vera Kovačević, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.4. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and seminar
Knowledge verification	Oral exam

Literature necessary for course

1. Adhesion Measurement of Films and Coatings, Ed. K.L: Mittal, VSP, Utrecht, 1995.
2. Acid.Base Interactions, Relevance to Adhesion Science and Technology, Eds. K.L. Mittal. H.R. Andersen, Jr., VSP,Utrecht,1991;Vol 2.Ed. K.L. Mittal,VSP, Utrecht, 2000.
3. J.Scheirs, Compositional and Failure Analysis of polymers, John Wiley & Sons, Chichester, 2000.
4. Paints and Related Materials: Current Techniques for Solving Coatings Problems, Ed. W.C. Golton, ASTM Publ., Baltimore,1992.
5. Y.S. Lipatov, Polymer Reinforcement, ChemTec Publishing, 1995.

Course content

Specialist knowledge needs by knowing the concept of quality system and methods of testing and measuring of adhesion with the necessary knowledge about the thin films mechanics. Physics of wetting and spreading. Mechanisms of adhesion, relation to the universal theory and practical adhesion. Chemistry of interfaces. The role of surface topography on the adhesion of coating films. Kinetics of failure in matrix and/or at the interface. Failure in adherents. Destructive and non-destructive tests of thin films and coatings adhesion. Effects of remained strains on the adhesive measurements. Simple test of thin film adhesion on the polymer carrier. Micro tests of adhesion. Mechanics of damage development. Mechanical properties of interphase. Laser technique in the measurement of interface strength. Relation to the properties of interphase. Quality evaluation of adhesion for films and coatings.Controlling the functionality of products.

Course	**SELECTED CHAPTERS OF STRUCTURE AND PROPERTIES OF POLYMER MATERIALS**
Lecturer	**PhD. Vesna Rek, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.5. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and seminar
Knowledge verification	Oral exam and seminar

Literature necessary for course

1. V. Eisele, Introduction to Polymer Physics, Spring Verlag, New York, 1990.
2. D. W. Clegg, A. A. Collyer, Structure and Properties of Polymeric Materials, The Institute of Materials, London, 1994.
3. H. L. Williams, Polymer Engineering, Elsevier, New York, 1985.
4. N. Grassie, Development in Polymer Degradation, Appl. Sci. Publ., London, 1980.
5. C. Hall, Polymer Materials, J. Wiley & Sons, New York, 1990.

Course content

Polymer structure and chemical compositions. Microstructure characteristics. Molecular structure and morphology of polymers. Dynamic structure of polymers. Deformation states. The influence of molecular and morphologycal structure on the deformation states. Specificity for thermoplastic elastomer, duroplaste and elastomers. Polymer liquids. Viscous flow. Viscoelasticity. Rheological properties. Mechanical properties. Dynamic mechanical properties. Relaxation. Temperature and time dependance. Specific and free volume. Creep and stress relaxation. Thermal properties. The stability under the influence of degradable factors. Ageing. Physical processes of ageing. Recycling. Evaluation of polymer waste. Multiphase polymer systems. Block copolymers. Polymer blends. Interpenetrate polymer networks. Cellular materials. Polymer dispersions. The influence of phases on the morphological structure and properties of multiphase polymer systems. Characterisation of structure, composition and properties of polymer materials.

Course	**COMPOSITE ADHESIVE MATERIALS AND PRODUCTS**
Lecturer	**PhD. Sanja Lučić Blagojević, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.6. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and seminar
Knowledge verification	Oral exam

Literature necessary for course

1. R.B. Seymour, Polymer Composites, VSP, Utrecht, 1990.
2. Polymer Nanocomposites: Synhesis, Characterisation, and Modeling, Ed: R.Krishnamoorti, R.A. Vaia, ACS, Washington, DC, 2002.
3. P.M. Ajayan, L.S. Schadler, P.V. Braun, Nanocomposite Science and Technology, Wiley-VCH, Weiheim, 2003.
4. R. Rothon, Particulate-Filled Polymer Composites, Long.Sci.& Tech.,Harlow, 1995.
5. Y.S. Lipatov, Adhesion of Polymers at the Interface with Solids, in: Polymer Reinforcement, ChemTec Publishing, Toronto, 1995.

Course content

Specialist knowledge needs by knowing the composite materials where the adhesion between the matrix and (nano)additives indicate the fundamental properties leading to the new quality of materials. General characteristics of composite materials. Adhesion phenomena between polymer matrix and filler particles. Particle packing and the maximum packing fraction. Specific techniques for filler surface characterisation; inverse gas chromatography, X-ray photoelectron spectroscopy, secondary ion mass spectroscopy. Interfacial contacts and boundary adhesion. Methods of filler surface modification. Effects od pre-treatment by stearic acid, and reactive organosilanes. Particulate-filled polymer blends. Nano-particles of fillers as compatibiliser at the interphase. Effects od adhesion matrix/filler. Models of mechanical behaviour of composite systems. Interaction coefficients. Enviromental influence and quality.

Course	**APPLIED RADIATION CHEMISTRY**
Lecturer	**PhD. Franjo Ranogajec, senior scientist**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 3.7. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. V.S. Ivanov: Radiation Chemistry of Polymers, VSP International science publisher, The Netherlands, 1992.
2. A. Singh, J. Silverman: Radiation Processing of Polymers (Polymer Processing Soc.: Progress in Polymer Processing) Hauser-Oxfort Univ. Press., Mun.-NY, 1992.
3. R.J. Woods, A.K. Pikaev: Applied Radiation Chemistry and Radiation Processing. J. Wiley, New York, 1994.
4. R.L. Clough, S.W. Shalaby: Irradiation of Polymers – Fundamentals and Technological Applications. American Chemical Society, Washington, DC, 1996.

Course content

Objectives of the course: To introduce basic principles of applied radiation chemistry and summarize the present status of radiation processing as well as the opportunities and problems associated with this technology.
Properties of ionizing radiation. Radioisotope sources. Characteristics of gamma radiation. Cobalt-60 and cesium-137 gamma sources. Machine sources. Characteristics of electron radiation. Electron accelerators. Interaction of radiation with matter. Radiation dosimetry-terms and units. Fundamental chemical effects. Radiation synthesis. Radiation polymerization and copolymerization. Radiation modification of polymers by grafting, crosslinking, degradation. Radiation stability of polymers.
Industrial processes: Radiation crosslinking polyolefin wire and cable insulation. Production of heat-shrinkable films and tubes. Production of cross-linked polyethylene foam. Vulcanization of elastomers. Curing of polymer coating onto wood, metal, paper or other substrates. Processes based on polymer degradation and other polymer modification. Radiation sterilization of medical products. Radiation treatment of natural and poluted water. Radiation treatment of industrial liquid wastes. Radiation treatment of sewage sludge. Radiation treatment of flue gases. Technical and economic comparison of irradiation and conventional methods. Advantages of radiation technology.

Course	**PETROCHEMISTRY**
Lecturer	**PhD. Ante Jukić, asisstant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 3.8. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. Z. Janović, Naftni i petrokemijski procesi i proizvodi, Hrvatsko društvo za goriva i maziva, Zagreb, 2005.
2. G.M. Wells, Handbook of Petrochemicals and Processes, Ashgate Publishing Limited, Hampshire, 1999.
3. S. Matar i L.F. Hatch, Chemistry of Petrochemical Processes, Gulf Publ. Co., Houston, 1994.
4. D. Klamann, Petrochemie, Technische Universitat Berlin, Berlin, 1991.
5. H.L. List, Petrochemical Technology, Prentice–Hall, Englerwood Cliffts, New Jersey, 1986.

Course content

Petrochemical processes and products: development and systematization. Basics of chemical reactions and processes of hydrocarbon conversions: mechanisms, thermodynamic and process parameters. Process optimization. Raw materials: petroleum derivatives, natural gas. Conversion processes of methane and synthesis gas; hydrogen, carbon monoxide, methanol, ammonia. Fischer-Tropsch synthesis. Pyrolysis - thermal hydrocarbon cracking: ethylene, propylene, C4 hydrocarbons. Aromatic hydrocarbons: raw materials, separation: distillation, solvent extraction, crystallization, complexation, adsorption. Technological processes of hydrogenation, dehydrogenation, alkylation, dealkylation: butadiene, butene, i-butene, methyl-terc.butyl ether. Processes of partial oxidation of ethylene, butane, benzene and xylene. Ammonoxidation of propylene and olefin hydroformilation. Ethylenoxide, acrylonitrile, acrylic acid, maleic anhydride, terephthalic acid. Cyclohexane, styrene and phenole. Halogenated carbohydrates; methane, ethylene and propylene chlorination, ethylene oxychlorination. Vinyl chloride monomer. Petrochemical processes in development.

Course	**STRUCTURE OF POLIMERIC MATERIALS**
Lecturer	**PhD. Ivan Šmit, senior research associate**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 3.9. Polymer Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. B. Wunderlich, Macromolecular Physics, Academic Press, New York, Vol. 1-1973, Vol. 2-1976, Vol. 3-1980.
2. A. E. Woodward, Understanding Polymer Morphology, Hanser, Munich, 1995.
3. L. C. Sawyer, D. T. Grubb, Polymer microscopy, Chapman&Hall, London, 1996.
4. P. J. Collings, M. Hird, Introduction to Liquid Crystals: Chemistry and Physics, Taylor&Francis, London, 1997.

Course content

Basic cocepts. Characteristics of polymer structure. Structural units and elements.
Microstructure. Macromolecule: constitution, configuration, and conformation. Macromolecular packing. Crystal structure. Mesostructure. Amorphous structure.
Supermoleculare structure (SMS). Basic SMS characteristics and levels. Macro-conformations of isolated and condensed macromolecules. Crystallization. Structural order in polymers. Defects and paracrystallinity. Degree of crystallinity. Crystallite size.
Isotropic SMS of polymers. Semicrystalline polymers. Models of chains packing. Morphological forms. Monocrystal. Complex forms. Spherulites. Structure of bulk semicrystalline polymers. Annealing. Mesomorphous polymers. Amorphous polymers.
SMS of oriented, anisotropic polymers. Topotactic polymerization and anisotropic crystallization. Morphological characteristics. Deformation mechanisms of condensed polymers. Fibres.Structural models of fibres. Structural hierarchy in fibre. Annealing.
Microphase and macrophase structure. Block copolymers: structure and morphology. Polymer blends. Polymer composites.

Course	**CHEMISTRY AND TECHNOLOGY OF NATURALE ZEOLITES**
Lecturer	**PhD. Štefica Cerjan- Stefanović, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.1. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, multimedia
Knowledge verification	Oral exam

Literature necessary for course

1. D.W.Breck :Zeolite Molecular Sieves, Kreiger Publication Company.Malabar,1984
2. C.Colella :Natural Zeolites for the Third Millennium, De Frede-editore, Napoli, 2000
3. M.M.J.Treacy, J.B.Higgins:Collection of Simulated XRD Powder Patterns for Zeolites, Elsevier, 2001
4. Ch.Baerlocher, W.M.Meir,D.H.Olson : Atlas of Zeolie franework types, Elsevier, 2001

Course content

Brief historical background.. Definition of zeolite. Chemical and structural properties of zeolite. Primary, secondary and tertiary units in structure of zeolite and their bonding (Lowenstein rule.). Hydrate competitive cations, isomorphic substitution of silica and aluminum. Chemical and structural characteristics of commercial most interesting tips of zeolite (A, X, Y, mordenit, ZSM-5, silikalit-1). Naturale zeolite (chemical and structural properties). Basic principles of hydrothermal modification of zeolite Analysis of crystalitation process and models of crystalization. Conservation of particles properties during transformation. Monitoring of "amorfic crystals".. Prospective. New trends in synthesis, posysintetic preparation and use of naturale zeolites. Naturale zeolite in chemical industry.

Course	**CHEMISTRY AND TECHNOLOGY OF ZEOLITES**
Lecturer	**PhD. Boris Subotić, senior scientist**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 4.2. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, multimedia
Knowledge verification	Oral exam

Literature necessary for course

1. D.W.Breck :Zeolite Molecular Sieves, Kreiger Publication Company.Malabar,1984
2. C.Colella :Natural Zeolites for the Third Millennium, De Frede-editore, Napoli, 2000
3. M.M.J.Treacy, J.B.Higgins :Collection of Simulated XRD Powder Patterns for Zeolites, Elsevier, 2001
4. Ch.Baerlocher, W.M.Meir,D.H.Olson : Atlas of Zeolie franework types, Elsevier, 2001

Course content

Short historical overview. Definition of zeolites. Chemical structure and properties of zeolites. Crystal structure of zeolites. Genesis. Chemical composition. Hydration and hydrolysis of zeolites. Principles of hydrothermal synthesis of zeolites. Analysis of processes of crystallization and models of zeolite crystallization. Critical processes of zeolite crystallization. Fundamental principles of the synthesis of high silica zeolites, aluminophosphates, mesoporous molecular sieves and nano-sized molecular sieves (zeolites). Influence of strong mechanical forces on the structure of zeolites. Transformation of zeolites: High-temperature transformations. Chemical transformations. Ion-exchange properties. Influence of metal ions on the structure and properties of zeolites. Prospecting: New trends in synthesis and post-synthesis treatments and application of zeolites.

Course	**CERAMICS AND NEW CERAMIC PROCESSING**
Lecturer	**PhD. Hrvoje Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.3. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, multimedia
Knowledge verification	Oral exam

Literature necessary for course

1. H.Yanagida, K.Koumoto, M.Miyayama, The chemistry of Ceramics, J.Wiley&Sons, Chichester, 1996.
2. N. Ichinose, Introduction to fine ceramics, J. Wiley & Sons, Chichester, 1987.
3. R.W. Cahn, P. Haasen, E.J. Kramer, Materials Science and Technology, Vo 17A ed. R.J. Brook, VCH Weinheim 1996.
4. T. A. Ring, Fundamental of Ceramics Powder, Processing and Synthesis, Ac. Press, San Diego 1996.
5. C. J. Brinker, G.W. Scherer Sol-gel science . The physics and chemistry of sol-gel processing. Ac. Press, Inc. 1990.

Course content

Physico-chemical principles. The position of ceramics in materials science. Raw materials. Synthetic materials and processing methods. Rheological behavior of slurries and pastes. Suspensions. Sterical and electrosterical stabilization of suspensions. Viscosity. Colloids. Plasticity. Forming processes, pressing., casting processes, plastic-forming processes. Molecular polimerization forming. Sol-gel methods. Gelation. Processing additives. Drying. Sintering. Structure of sintered bodies. Structure of porous ceramics. Thin ceramic films. Fibers. Dopands. Ceramics composites New processing methods. Hydrothermal synthesis. Chemical vapor deposition (CVD) Flame pyrolysis, Plasma pyrolysis.. Epitactic growth. Silicate ceramics. Oxide ceramics (Al2O3, ZrO2, mullite ZrO_2 and stabilized ZrO_2). Toughness. Non-oxide ceramics (Si_3N_4; SiC, AlN, sialons) Bioceramics, biocompatible and bioactive materials. Nano-particles and nano-composites. Viskers. Technical ceramics. Structural ceramics. Electronic and optoelectronic ceramics. Translucent ceramics.

Course	**SILICATE CHEMISTRY**
Lecturer	**PhD. S. Kurajica, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.4. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. A. Petzold, Physikalische Chemie der Silicate, und nichtoxidischen Silicimverbindungen, Deutscher Verlag für Grundstoffindustrie, Leipzig 1991.
2. F. Liebau, Structural Chemistry of Silicates, Springer-Verlag, Berlin-Heidelberg-New York-Tokyo, 1985.
3. C. J. Brinker, G.W. Scherer Sol-gel science . The physics and chemistry of sol-gel processing., Academic Press Inc., Boston

Course content

Type of bonds in silicates. Polarization and deformation. Coordination polyhedrons and stability conditions. Complex ionic structures. Pauling's rules. Structure, characteristic and properties of silicates melts. Physico-chemical processes on the silicate surface. Introduction in silcates thermodynamics. Thermodynamic of phase transformation (in solid state, melting process and crystallization). Theory of heterogeneous phase equilibrium. Monophase and multiphase systems. Eutectic systems and congruent melting silicates. Incongruent melting silicates. Phase decomposition in liquid state. The principles of $[SiO_4]$-tetrahedron polymerization. Stability criteria for silicate structures. The classification and nomenclature of silicates. Technically important silicates systems (SiO_2, Al_2O_3-SiO_2, $Na_2O(K_2O)$-SiO_2, $CaO(MgO)$-SiO_2, $Na_2O(K_2O)$-Al_2O_3-SiO_2, CaO-MgO-SiO_2, $CaO(MgO)$-Al_2O_3-SiO_2, etc. Inorganic non-oxide and oxinitride silicon compounds. Systems: Si-C, Si-N, Si-Al-O-N. Organosilicon compaunds (concept, division, nomenclature). Synthesis, structure and properties of organosilicon compounds.

Course	**SILICATE CHEMISTRY**
Lecturer	**PhD. Hrvoje Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.4. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. Petzold, Physikalische Chemie der Silicate, und nichtoxidischen Silicimverbindungen, Deutscher Verlag für Grundstoffindustrie, Leipzig 1991.
2. F. Liebau, Structural Chemistry of Silicates, Springer-Verlag, Berlin-Heidelberg-New York-Tokyo, 1985.
3. J. Brinker, G.W. Scherer Sol-gel science . The physics and chemistry of sol-gel processing., Academic Press Inc., Boston

Course content

Type of bonds in silicates. Polarization and deformation. Coordination polyhedrons and stability conditions. Complex ionic structures. Pauling's rules. Structure, characteristic and properties of silicates melts. Physico-chemical processes on the silicate surface. Introduction in silcates thermodynamics. Thermodynamic of phase transformation (in solid state, melting process and crystallization). Theory of heterogeneous phase equilibrium. Monophase and multiphase systems. Eutectic systems and congruent melting silicates. Incongruent melting silicates. Phase decomposition in liquid state. The principles of $[SiO_4]$-tetrahedron polymerization. Stability criteria for silicate structures. The classification and nomenclature of silicates. Technically important silicates systems (SiO_2, Al_2O_3-SiO_2, $Na_2O(K_2O)$-SiO_2, $CaO(MgO)$-SiO_2, $Na_2O(K_2O)$-Al_2O_3-SiO_2, CaO-MgO-SiO_2, $CaO(MgO)$-Al_2O_3-SiO_2, etc. Inorganic non-oxide and oxinitride silicon compounds. Systems: Si-C, Si-N, Si-Al-O-N. Organosilicon compaunds (concept, division, nomenclature). Synthesis, structure and properties of organosilicon compounds.

Course	**USE OF COMPUTER TECHNIQUES IN THE DIFFRACTION ANALYSIS OF THE MATERIALS**
Lecturer	**PhD. Goran Štefanić, assistant research professor**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 4.5. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. H. P. Klug, L. E. Alexander: *X-ray Diffraction Procedures*, 2nd edition, John Wiley & Sons, New York 1974., pp. 640-642, (Fig. 9.9).
2. L. Bish & J. E. Post, Modern Powder Diffraction, Reviews in Mineralogy Vol. 20, Mineralogical Society of America, Michigan, 1989.
3. C. Suryanarayana, M. Grant Norton: X-Ray Diffraction A Practical Approach, Plenum Press, New York, 1998.
4. W. I. F. David, K. Shankland, L. B. McCusker, Ch. Baerlocher, Structure Determination From Powder Diffraction Data, Oxford University Press; 1st ed. 2002.
5. Samuel M. Allen, Edwin L. Thomas, The Structure of Materials, MIT Series in Materials Science and Engineering, Wiley, 1999.

Course content

Classification of diffraction techniques (x-ray diffraction, electron diffraction, neutron diffraction, synchrotron diffraction). Powder-pattern-fitting methods. Individual profile fitting. Whole-powder-pattern fitting. Rietveld method. Practical aspects of the use of computer techniques in the analysis of powder materials. Determination of crystal structure using Rietveld refinement. Principles of qualitative phase analysis. Principles of quantitative phase analysis (internal-standard method, external-standard method, Rietveld refinement). Determination of the degree of crystallinity (crystallization kinetic). Principles of the texture analysis. Precise determination of lattice parameters. Determination of macroscopic strain and stress of the material. Determination of microscopic strains (defects) and crystallite sizes from line broadening analysis (Warren-Averbach method, integral breadth method, Rietveld refinement).

Exercise: Computer analysis of the diffraction patterns - practical approach:

- Qualitative phase analysis using ICDD PDF-2 data
- Diffraction pattern from atom positions and beam wavelengths (program PCW)
- Quantitative phase analysis using the Rietveld method (program MAUD)
- Precise determination of lattice parameters (program GSAS)
- Indexing and determination of space group of the unknown crystal phase using computer analysis of the diffraction data (programs ITO, TREOR and DICVOL)
- Determination of simple crystal structures (cubic and hexagonal case)

Determination of microscopic strain (defects) and crystallite size from line broadening analysis (programs SHADOW and BREADTH)

Course	**STRUCTURE AND PROPERTIES OF INORGANIC GLASSES**
Lecturer	**PhD. Hrvoje Ivanković, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.6. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. W.Vogel, Chemistry of glass, Springer Verlag , 1992.
2. M.H.Lewis, Glasses and Glass-Cheramics, Chapman & Hall, London, N.Y. 1989.
3. A.Paul, Chemistry of Glasses, 2nd ed., Chapman and Hall, London, N.Y. 1990.
4. Strnad, Glass-Ceramics Materials, Elsevier, Amsterdam-Oxford-New York-Tokyo, 1988.
5. R. Reisfeld and C.K. Jorgensen, Chemistry, spectroscopy and application of Sol-gel Glasses. Springer Verlag, Berlin, 1992.

Course content

Noncrystalline solids. Glass formation from a liquid-, a gas- and a solid phase. The vitreous transition. Determination of T_g. Conditions for vitrification. Structural and kinetic theories. The mechanism of crystallization, nucleation and crystal growth. Kinetics of crystal growth. Methods of structure determination. Phase separation in glasses. Immiscibility phenomena in glasses. Classification. Oxide glasses. Glasses formed by a combination of several glass formers. Halide and chalcogenide glasses. Metallic glasses. Property-composition relations. Rheological, electrical, optical, thermal, and mechanical properties of glasses. Internal stress and annealing. The surface of glasses. Glass-ceramics. Controlled crystallization of glass, nucleation catalysts. Glass-ceramic processes. Synthesis of glasses from gels, methods of gel formation, chemical effects. Colorants and luminescent species in sol-gel glasses. Viscous flow sintering. Devitrification kinetics. TTT diagrams. Glass-ceramics with minimal coefficients of thermal expansion. Mashinable glass-ceramics. Sintered glass-ceramics. Glass-ceramic systems prepared by sol-gel technique. Oxinitride glass-ceramics. Fibers reinforced glasses and glass-ceramics.

Course	**STRUCTURE AND PROPERTIES OF INORGANIC GLASSES**
Lecturer	**PhD. Stanislav Kurajica, associate professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.6. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. W.Vogel, Chemistry of glass, Springer Verlag , 1992.
2. M.H.Lewis, Glasses and Glass-Cheramics, Chapman & Hall, London, N.Y. 1989.
3. A.Paul, Chemistry of Glasses, 2nd ed., Chapman and Hall, London, N.Y. 1990.
4. Strnad, Glass-Ceramics Materials, Elsevier, Amsterdam-Oxford-New York-Tokyo, 1988.
5. R. Reisfeld and C.K. Jorgensen, Chemistry, spectroscopy and application of Sol-gel Glasses. Springer Verlag, Berlin, 1992.

Course content

Noncrystalline solids. Glass formation from a liquid-, a gas- and a solid phase. The vitreous transition. Determination of T_g. Conditions for vitrification. Structural and kinetic theories. The mechanism of crystallization, nucleation and crystal growth. Kinetics of crystal growth. Methods of structure determination. Phase separation in glasses. Immiscibility phenomena in glasses. Classification. Oxide glasses. Glasses formed by a combination of several glass formers. Halide and chalcogenide glasses. Metallic glasses. Property-composition relations. Rheological, electrical, optical, thermal, and mechanical properties of glasses. Internal stress and annealing. The surface of glasses. Glass-ceramics. Controlled crystallization of glass, nucleation catalysts. Glass-ceramic processes. Synthesis of glasses from gels, methods of gel formation, chemical effects. Colorants and luminescent species in sol-gel glasses. Viscous flow sintering. Devitrification kinetics. TTT diagrams. Glass-ceramics with minimal coefficients of thermal expansion. Mashinable glass-ceramics. Sintered glass-ceramics. Glass-ceramic systems prepared by sol-gel technique. Oxinitride glass-ceramics. Fibers reinforced glasses and glass-ceramics.

Course	**CEMENT**
Lecturer	**PhD. Juraj Šipušić, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.7. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. J. Bensted and P. Barnes, Structure and Performance of Cements, 2nd Edition, Routledge mot E F & N Spon, London, 2002.
2. M.S.J. Gani, Cement and Concrete, Chapman & Hall, London, 1997.
3. P.K. Mehta, Concrete: Structure, Properties and Materials, Prentice-Hall, New Jersey, 1986.
4. Bezjak, Računalni programi za simulaciju tijeka kristalizacije faza cementa na temelju faznih dijagrama i kinetike procesa hidratacije cementa, Zagreb, 2003.

Course content

Crystal phases of Portland and Calcium Aluminate Cements. Crystal structure and reactivity of crystal phases. Phase diagrams. Two component systems $CaO\text{-}Al_2O_3$ and $CaO\text{-}SiO_2$. Three component system $CaO\text{-}Al_2O_3\text{-}SiO_2$. Four component system $CaO\text{-}Al_2O_3\text{-}SiO_2\text{-}Fe_2O_3$. Minor elements in crystal phases. Hydration process of Portland and Calcium Aluminate Cement clinkers. Mechanism of hydration process. Kinetics of hydration process. Influence of hydration mechanism on the properties of hardened cement composite.

Course	**SEMICONDUCTOR MATERIALS**
Lecturer	**PhD. Mirjana Metikoš-Huković, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 4.8. Inorganic Nonmetallic Materials
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. N. Sato, Electrochemistry at Metal and Semiconductor Electrodes, Elsevier, Amsterdam, 1998.
2. Peter G. Bruce (Ed.), Solid State Electrochemistry, Cambridge University Press, Great Britain, 1995.
3. V. Šips, Osnove fizike čvrstog stanja, Školska knjiga, Zagreb, 1991.
4. H. Gerischer and C.W.Tobias (Eds.), Advances in Electrochemical Science and Engineering, Vo. l, VCH, Weinheim, New York, 1990.
5. Yu.V. Pleskov, Semiconductor Electrochemistry, Plenum Press, N.Y., 1986.
6. R. Morrison, Electrochemistry at Semiconductors and Oxidized Metal Electrodes, Plenum Press, N.Y., 1980.

Course content

The theory of energy bands in the condensed state: quantum wave mechanics and waves of matter, the energy of electrons, application of the energy band theory (isolators, semiconductors, metals). Free electrons in emtals: the model of free electrons, Fermi-Dirac distribution, the energy distribution of electrons, electric and thermal conductivity of metals. Electrons and holes - charge carriers in semiconductors. Semiconductor doping, electronic structure and conductivity of doped semiconductors. Determination of the conductivity type, optical methods, Hall's effect. Organic semiconductors: electronic structure, charge carriers (soliton, polaron), physical properties, conductivity. Semiconductor-electrolyte contact: the space charge layer, Schottky barrier, the flat band potential, reactions at phase boundaries involving ion transfer, reactions at the phase boundary involving charge transfer. Semiconductor - metal contact: correction properties (resistance theory), diode, semiconductor diode, transistor. Energy conversion: photopotential effects at the contact metal/semiconductor, photopotential cells. Selected examples and research techniques: the general electric and optical properties: styrene, polypirrole, perylene, anthracene, silicium, germanium; binary complexes of the elements from the third and fifth group (galium-antimonide, galium-arsenide, indium-antimonide, indium-phosphide).
Laboratory: Three to five laboratory exercises related to the topics discussed in the lectures.

Course	**MATERIALS CORROSION AND COMPUTER MODELING IN CORROSION**
Lecturer	**PhD. Sanja Martinez, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 5.1. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, laboratory
Knowledge verification	Oral exam

Literature necessary for course

1. D.A. Jones, Principles and Prevention of Corrosion, 2nd. Ed., Prentice Hall, Upper Sadle River, 1996.
2. Mansfeld, Ed., Corrosion Mechanisms, Chemical Industries/28, Marcel Dekker, New York, 1987.
3. R. Askeland, The Science and Engineering of Materials, Chapman & Hall, London, 1984.
4. J. O'M. Bockris, A. K. N. Reddy and M. Gamboa-Aldeco, Modern Electrochemistry 2A, 2nd ed., Kulwer Academic / Plenum Publishers, New York, 2000.

Course content

Course objective is to get student acquainted with the corrosion mechanisms of metallic materials based on microscopic and macroscopic structural properties of materials, electronic structure, electric and dielectric properties of thin surface films and electrical conductivity of materials.
Course objective is to get student acquainted with application mathematical methods and of computers in the investigation of corrosion systems in order for them to acquire better understanding of the underlying physical picture and the models by which it is described. The objective is also to teach students the possibilities offered by computational quantitative analysis of experimenatal corrosion data and application of the derived results on estimation of corrosion behavior of materials. The computational methods of will also include modeling of the corrosion protection systems with the aim of assessment of their efficiency and durability.
Corrosion reactions with soluble and insoluble products. Thermodynamics of the corrosion process. Kinetics of the corrosion process. Corrosion process and the frontier orbital theory. Experimental determination of the kinetic corrosion parameters. Passivity and passivation. Passive layer – phase boundary reactions, current transport trough the layer, electrical field, growth and breakdown. Passivity alloys – the influence of alloying elements. Applications of corrosion-resistant alloys. Localized corrosion. Galvanic corrosion. Potential and current density distribution in localized and galvanic corrosion systems. Concentration corrosion cells. Pitting and crevice corrosion. Stress corrosion cracking. Influence of the metallurgical structure of materials on corrosion – intergranular and weldment corrosion. The influence of hydrogen diffusion into metal and hydrogen-related corrosion damage. Tribocorrosion – erosion and fretting corrosion. Materials prone to and resistant to specific forms of corrosion attack. Corrosion of materials under particular conditions – water and aqueous solutions (sea, soil, concrete i industrial processes) and atmosphere. Corrosion of biomaterials. Corrosion

protection of materials by surface modification. Corrosion resistant metallic and conversion coatings. Protection by organic coatings. Electrochemical methods of corrosion protection.
Laborathory experiments: Thermodynamics of corrosion - construction of Pourbaix diagrams. Measurement of corrosion potentials in solutions of various pH. Testing of inhibitor performance: determination of kinetic parameters, Arrhenius plots, adsorption isotherms. Corrosion under controlled hydrodynamic conditions: rotating disk, flow channel and jet impingement measurements. Passive layer formation - anodization of aluminum, cyclic voltammetry on stainless steel. Corrosion of structural steel in reinforced concrete: determination of the effects of chemical admixtures. Potential distribution and protection criteria in cathodic protection systems: a) impressed current system and b) sacrificial anode system.
Models of electrochemical corrosion processes. Programs for the quantitative analysis of the polarization curves and electrochemical impedances spectroscopy measurements. Assessment of the performance of materials, protection inorganic and organic coatings and corrosion inhibitors and their applicability under specific conditions, base on the results of the measurements and modeling. Computer simulation of the industrial application of the inhibitor. Atomistic modeling of the corrosion process. Application of molecular modeling in corrosion. Modeling of galvanic and localized corrosion and application of the modeling results on the construction design.. Deterministic theory and modeling of durability of construction exposed to corrosive environment. Modeling of the cathodic protection systems..
Computational lab:
Computer-lab excecises include construction and application of programs for quantitative analysis of experimental corrosion data (application of linear, nonlinear and coplex nonlinear fit), constructions of programs for visual representation of basic corrosion kinetic models, Programs for calculation of potential and current distributions in corrosion systems and aaplication to medeling of the corrosion protection systems.

Course	**CORROSION PROTECTION OF MATERIALS BY ELECTROPLATING**
Lecturer	**PhD. Antonija Meštrović-Markovinović, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 5.2. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures, laboratory
Knowledge verification	Oral exam

Literature necessary for course

1. D. Pletcher, F. C. Walsh, Industrial Electrochemistry, Chapman and Hall, London, 1990.
2. E. Heitz, G. Kreysa, Principles of Electrochemical Engineering**,** VCH, Weinheim, 1986.
3. F. Goodridge, K. Scott, Electrochemical Process Engineerig**,** Plenum Press, N. Y., 1995.
4. J.C. Puippe (Ed.), Theory and Practice of Pulse Plating**,** American Electroplaters and Surface Finishers Society, Orlando, Florida, 1986.
5. M. Nagayama (Ed.), New Materials and New Processes, Vol. 2**,** JEC Press Inc. Ohio, 1983.

Course content

Metallic coatings play a significant role in corrosion protection of metals. It is very important for the coating to be homogenous throughout the entire surface, that it is compact and adheres well to the substrate.
In order to ensure the necessary quality of coatings, three approaches have been developed for monitoring of the electroplating process:

- the classical approach
- fast electroplating
- electroplating with periodical current changes.

This course will consider in more detail the important characteristics of all three procedures.

Course	**BIOMEDICAL IMPLANT MATERIALS**
Lecturer	**PhD. Ingrid Milošev, research professor**
Institution	Institute «Jožef Stefan» Ljubljana, Slovenia
ECTS	8
Course type	Optional 5.3. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. R.W. Cahn, P. Haansen, E.J. Kramer, ed. "Materials Science and Technology", Medical Dental Materials, Vol. 14, Weinheim, New York, Basel; Cambridge.
2. B.F. Morrey, ed. "Biological, Material and Mechnanical Considerations of Joint Replacement", Raven Press, 1993.
3. P.Kovacs, N.S. Istephanous, ed. "Compatibility of Biomedical Implants", The Electrochemical Society, 1994.
4. D.F. Williams, ed. "Biocompatibilty of Clinical Implant Materials" Vol. I, II, CRC Press, 1981.

Course content

Objectives of the course: To learn about the properties of metal, ceramic and polymer materials used for biomedical applications. To learn about the processes occurring at the surfaces of these materials and their possible local and systemic effects on human body.
Alloys used in biomedical applications: TiAlV, TiAlNb, CoCrMo, FeCrNiMo Mechanical properties. Physical properties. Corrosion resistance. Clinical applications.
Ceramics used in biomedical applications: Al_2O_3, ZrO_2-Y_2O_3, hydroxyapatite. Mechanical properties. Physical properties. Manufacture. Clinical applications.
Polymers used in biomedical applications: Polyethylene, teflon, silicon Mechanical properties. Physical properties. Manufacture. Clinical applications.
In vitro investigations of biocompatibility. Basic terms. Corrosion research. Tribological research. Immunological research.
In vivo investigations of biocompatibility. Tissue response to implant. Corrosion and wear products. Systemic effects. Toxicity and carcinogenicity of metal products.

Course	**A CHEMICAL APPROACH TO NANOTECHNOLOGY: FUNDAMENTALS AND APPLICATIONS**
Lecturer	**PhD. Saša Omanović, assistant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 5.4. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	1 st term
Lecture type	Lectures
Knowledge verification	oral exam

Literature necessary for course

1. Bharat Bhushan: Springer Handbook of Nanotechnology, Springer-Verlag, 2004.
2. M.Ratner, D.Ratner, Nanotechnology A Gentle Introduction to the Next Big Idea, Prentice Hall, 2003.
3. C.P. Poole Jr., F. J. Owens, Introduction to Nanotechnology, Wiley, 2003.
4. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons: Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall, 2002.
5. Scientific American, editors at Scientific American: Understanding, Nanotechnology, Warner Books, 2002.
6. A.J. Bard, Integrated Chemical Systems: A Chemical Approach to Nanotechnology, Willey, 1994.
7. S.Omanovic, CHEE489 Course pack, McGill University, 2004.

Course content

Course objective: to provide graduate students with the knowledge in the area of fundamental and applied nanotechnology. Nanotechnology is defined as manipulation, production and use of materials, devices and systems on a nanometer scale, at which classical theories of chemistry, physics and biology cannot always be applied. The major trend in research and development of new technologies is going towards miniaturization. In order to enable this, the design and control should also be based on the nanometer scale.

Introduction: What is nanotechnology? Why is nanotechnology special? Nanomaterials and approaches to nanomaterials production: Chemical approaches to production of nanoparticles. Self-assembly into supermolecules, dendrimers and surface-active micelles, DNA, nanoporous materials, organo-metallic structures. Catalytic and pre-deffined approaches, Nanolithography and structural labeling. Chemical and physical approaches to nanocomposites, alloys, oxides and catalysts.

Experimental techniques use to characterize nanomaterials: Electron microscopy (SEM, EDX, TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), X-ray techniques (XRD/XRF, XPS/AES), Surface/interface techniques (adsorption, surface tension, zeta-potential, Polarization Modulation Infrared Reflection Absorption Spectroscopy), Specific applications of nanotechnology: Fuel cells, Biofuel cells, Hydrogen production in PEM generators, Reversible fuel cells, Nanostructured oxide materials as catalysts for wastewater treatment (electrochemical and photo-electrochemical systems), Nanotechnology in the area of medical biosensors development and controlled drug release, Development of bio-electrochemical reactors for bioelectrolysis.

Course	**NANOSTRUCTURED METAL OXIDES - SYNTHESIS AND APPLICATIONS**
Lecturer	**PhD. Mira Ristić, research professor**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 5.5. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. C. J. Brinker, G. W. Scherer: Sol-Gel Science, The Physics and Chemistry of Sol-Gel Processing, Academic Press Inc. San Diego, USA, 1990.
2. J-P. Jolivet: Metal Oxide Chemistry and Synthesis, From Solution to Solid State, John wiley & Sons, Ltd, west Sussex, England, 2000.
3. Nanostructured Materials., Processing, Properties and Applications, Edited by Carl Koch, William Andrew Publisching, New Yourk, 2002.
4. M. A. Willard, L. K. Kurihara, E. E. Carpenter, S. Calvin, V. G. Harris. Chemically prepared magnetic nanoparticles. International materials Reviews, **49** (2004) 1-48.

Course content

Nanoscience and nanotechnology - bacground overviw. Classifications of nanomaterials (inorganic, organic, biological, composites). Applications of nanomaterials in the chemical catalxsis, electronics, optoelectronics, medicine, in manufacturing of sensors, magnetic recording media, advanced ceramics etc. Relationship between the route of cheramical synthesis and corresponding chemical, microstructural and pyhsical properties. Syntesis methods for fabrication of powdered nanoparticles – general overview. Sol-gel processes. Microemulsion hydrolysis. Precipitation from aqueous solution. Aerosol pyrolysis. Thermal decomposition techniques. Sonochemical method. Applications of vacuum techniques in the fabrication of nanofilms. Designing of nanoparticles for specific use. Synthesis of metal oxide nanosized (examples: SnO_2, TiO_2, Ga_2O_3, ZnO, CdO, WO_3, V_2O_5, Nb_2O_5, etc.). Magnetic nanoparticles – ferrites nanoparticles. Application of different spectroscopic techniques and electron microscopy in the nanoparticles characterization (elaboration of the examples).
Practice: Demonstration of sol-gel synthesis and introduction to selected instrumental technique. Students are encourage to participate in carrying out their own experiments.

Course	**NANOSTRUCTURED METAL OXIDES - SYNTHESIS AND APPLICATIONS**
Lecturer	**PhD. Marijan Gotić, senior research associate**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 5.5. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. C. J. Brinker, G. W. Scherer: Sol-Gel Science, The Physics and Chemistry of Sol-Gel Processing, Academic Press Inc. San Diego, USA, 1990.
2. J-P. Jolivet: Metal Oxide Chemistry and Synthesis, From Solution to Solid State, John wiley & Sons, Ltd, west Sussex, England, 2000.
3. Nanostructured Materials., Processing, Properties and Applications, Edited by Carl Koch, William Andrew Publisching, New Yourk, 2002.
4. M. A. Willard, L. K. Kurihara, E. E. Carpenter, S. Calvin, V. G. Harris. Chemically prepared magnetic nanoparticles. International materials Reviews, **49** (2004) 1-48.

Course content

Nanoscience and nanotechnology - bacground overviw. Classifications of nanomaterials (inorganic, organic, biological, composites). Applications of nanomaterials in the chemical catalxsis, electronics, optoelectronics, medicine, in manufacturing of sensors, magnetic recording media, advanced ceramics etc. Relationship between the route of cheramical synthesis and corresponding chemical, microstructural and pyhsical properties. Syntesis methods for fabrication of powdered nanoparticles – general overview. Sol-gel processes. Microemulsion hydrolysis. Precipitation from aqueous solution. Aerosol pyrolysis. Thermal decomposition techniques. Sonochemical method. Applications of vacuum techniques in the fabrication of nanofilms. Designing of nanoparticles for specific use. Synthesis of metal oxide nanosized (examples: SnO_2, TiO_2, Ga_2O_3, ZnO, CdO, WO_3, V_2O_5, Nb_2O_5, etc.). Magnetic nanoparticles – ferrites nanoparticles. Application of different spectroscopic techniques and electron microscopy in the nanoparticles characterization (elaboration of the examples).
Practice: Demonstration of sol-gel synthesis and introduction to selected instrumental technique. Students are encourage to participate in carrying out their own experiments.

Course	**METAL HYDRIDES AND HYDROGEN ECONOMY**
Lecturer	**PhD. Antun Drašner, senior research associate**
Institution	Ruder Boskovic Institute, Zagreb
ECTS	8
Course type	Optional 5.6. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and multimedial
Knowledge verification	Oral exam

Literature necessary for course

1. H. J. Goldschmidt, Interstitial Alloys, Butterworths, London, 1967.
2. G. Alfeld, J. Volkl, (Eds.), Hydrogen in Metals I, Springer-Verlag, Berlin Heidelberg, New York, 1978.
3. G. Alfeld, J. Volkl, (Eds.), Hydrogen in Metals II, Springer-Verlag, Berlin Heidelberg, New York, 1978.
4. L. Schlapbach, (Ed.), Hydrogen in Intermetallic Compounds I, Springer-Verlag, Berlin Heidelberg, New York, 1988.
5. L. Schlapbach, (Ed.), Hydrogen in Intermetallic Compounds II, Springer-Verlag, Berlin Heidelberg, New York, 1992.

Course content

Course	**FUEL CELLS**
Lecturer	**PhD. Ante Jukić, asisstant professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 5.7. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures
Knowledge verification	Oral exam

Literature necessary for course

1. K. Kordesh, G. Simader. Fuel cells and their applications, VCH, Weinheim 1996.
2. H. A. Liebhafsky, E. J. Cairns. Fuel Cells and Fuel Batteries: A Guide to Their Research and Development. John Wiley & Sons, New York, 1969.
3. D. P. Wilkinson, J. St. Pierre. Handbook of Fuel Cells – Fundamentals, Technology, and Applications, Vol. 3, 2003.
4. Fuel Cells Handbook, 6th ed., DOE/NETL-2000/1179 (CD) (Nov 2002.)
5. S. C. Singhal, K. Kendall (Ed.), High Temperature Solid Oxide Fuel Cells: Fundamentals, Design, and Applications, Elsevier, Oxford, 2003.

Course content

Introduction: history overview, advantages and disadvantages. Applications; technical, environmental and energy impact. Hydrogen-oxygen reversible fuel cell: processes and reaction mechanisms at anode and cathode. Electrode materials. Kinetics of electrocatalytic electrode reactions. Catalysts, nanostructurated, bimetallic. Electrocatalytic properties and efficiency. Analytical techniques in catalyst surface characterization: XPS, SEM, Auger, and AFM. Electrolyte systems; proton exchange membranes, ionic conductors. Fuels resources and their utilization: oxygen (air), hydrogen, carbohydrates: coal, natural gas, methanol. Fuel cells performance and thermodynamics; operating conditions. Fuel cells with reforming unit. Polymer Electrolyte Fuel Cell (PEFC); Alkaline Fuel Cell (AFC); Phosphoric Acid Fuel Cell (PAFC); Molten Carbonate Fuel Cell (MCFC); Solid Oxide Fuel Cell (SOFC). Methanol Fuel Cell (MFC). Gas diffusion electrodes. Fuel cell systems, design, optimization, modular nature.

Course	**COMPUTERIZED EXPERIMENTS**
Lecturer	**PhD. Laszlo Sipos, full professor**
Institution	Faculty of Chemical Engineering and Technology, Zagreb
ECTS	8
Course type	Optional 5.8. Corrosion of Materials and Alternative Energy Sources
Name of study	Engineering Chemistry
Study	Doctoral study
Term	2nd term
Lecture type	Lectures and multimedial
Knowledge verification	Oral exam

Literature necessary for course

1. B.H. Vassos and G.W. Ewing, "Analog and Computer Electronics for Scientists", [4]Wiley-Interscience, New York, 1993.
2. G. Smiljanić, "Mikroračunala", Školska knjiga, Zagreb, 1991.
3. J. Šribar I B. Motik, "Demistificirani C^{++}", [2]Element, Zagreb, 2001.
4. B. Stroustrup, "The C^{++} Programming Language", [3]Addison-Wesley, Boston, USA, 2001.

Course content

Basic analog electronics: diodes, transistors, operational amplifiers, transducers. Basic digital electronics: binary logic gates, flip-flops, registers, DA and AD converters. The digital computer: computer architecture, data communications and programming. Interfacing measuring instruments with computer. Data processing and storage. Remote data collection and instrument control.

Construction and programming of a computerized remote pH and temperature measuring system

II. 3. 5. Rhythm of studying and students` obligations

Students sign up for three basic courses in 1st semester and three elective courses in 2nd semester. The total number of ECTS credits for subjects is 60 ECTS credits and the elaboration of doctor's thesis is 120 ECTS credits, it means 180 ECTS credits total. Before defending the doctor's thesis, the student must publish one scientific article in CC magazine.

The courses are divided into two categories: basic ones and elective ones/special ones in the following groups of subjects: Polymer materials, Inorganic and Nonmetallic Materials, Quality of Environment, Processes and Products, Organic synthetic products, Corrosion of Materials and Alternative Sources of Energy. Teaching is performed in the form of lectures, seminars and laboratory exercises. The final thesis (dissertation) is the integral part of the study. During the elaboration of dissertation the student becomes able to solve the actual scientific problems independently. The dissertation must present the independent originally made work written in Croatian or English. The theme of the dissertation must be taken from the field which exists at the Faculty.

The scientific research work is the most important part of the doctoral study. It must be of the top quality and the greatest part of time must be paid to it. The research must be original and innovative and the results should be published at least in one article in the magazine which cites CC. The mentor must be able to lead the research suggested for the dissertation (to be at the level of his colleagues from EU) which is proved by his up to day scientific research work and publications in CC magazines in the field in which the dissertation is made (this is the most important factor for the successfulness of the doctoral study). Except that, the mentor has to ensure the space and equipment for qualitative scientific-research work. He, in the agreement with the candidate for the doctor's degree must choose the theme of dissertation which must be finished in the period of postgraduate study duration.

II. 3. 6. System of leading through the study

The study of the Engineering Chemistry has a leader of the study who directs the students into the choice of courses and monitors their work. The Faculty Council names the mentor for each student on the suggestion of the leader of the postgraduate study. The mentor as a rule is the lecturer of the Faculty, while the mentors who are out of the faculty must have the approval from the Faculty Council for each particular case.

II 3.7. List of subjects from other postgraduate studies

Students of Engineering Chemistry can sign up for courses of postgraduate doctoral study Chemical Engineering and Ecoengineering and specialistic programs Ecoengineering and Corrosion Protection. They can also choose the subjects from other postgraduate doctoral and spcialistic studies from the Faculties of the University in Zagreb in the amount of 20% that is 12 ECTS credits.

II 3.8. List of subjects that can be taught in foreign language

All the mentioned subjects can be taught in English.

II. 3. 9. Criteria and conditions for transfer of ECTS credits

If a student signs in for the subjects from other courses at the faculty or the studies from other faculties at the University in Zagreb, they have the same number of credits as the elective subjects that is 8 ECTS credits.

II.3.10. The way of finishing the study and conditions for recording the doctoral thesis theme

During the study, no later than the end of 1st year of the doctoral study, the student is obliged to suggest the theme and explanation of his final work in accordance with the mentor. The theme with the explanation is accepted by the Faculty Council and it is confirmed by the Faculty Senate. During the doctoral study, the student is obliged to have one presentation of the doctoral theme. Before defending the doctoral theme the student must publish one scientific work from the field comprised in the doctoral theme. Doctoral theme which is not defended in the course of 6 years from the day of the theme acceptance is subjected to the renewed acceptance process. Doctoral theme is defended in front of the Commission consisting of three members (exceptionally five members) and one member as the substitute in the scientific- teaching profession and in the field and area connected with the doctoral theme. Student's mentor cannot be the president for evaluating and defending the theme. One member of the Commission for evaluating and defending the doctoral thesis must be out of the faculty. Defending of doctoral thesis is open to public and must be announced on the bulletin board of the faculty at least eight days before the presentation. The Commission composes and signs the record of theme defending.

II. 3.11. Conditions under which the students who interrupted their study or who lost right to study at one courses can continue their study

The book of rules of studying will solve all the conditions of transition and possibilities of continuation the study.

II. 3.12. Conditions under which the attendant gets the right on confirmation about becoming elligible for the part of the doctoral study as the part of the whole-life education

II. 3.14. Maximal length of studying from the beginning to the end

The studying length is three years, and the maximal studying length from the beginning up to the end is six years.

4. Conditions of course performing

4.1 Places for course program performing
Course programs are performed in lecture-room, laboratories and computer class-rooms of the Faculty.

4.2 Data about the facilities and equipment foreseen for course performing
The Faculty has at its disposal:
a) lecture-rooms:

Big lecture-room at Marulićev trg (Marulić square) 20	120 places
Big lecture-room at Marulićev trg (Marulić square) 19	180 places
Small lecture-room at Marulićev trg (Marulić square) 20	70 places
Small lecture-room at Marulićev trg (Marulić square) 19	50 places
Big lecture-room in Savska cesta (Savska street) 16	80 places
Small lecture-room in Savska cesta (Savska street) 16	30 places
3 lecture-rooms of the Department each having	10 places

b) laboratories:

Marulićev trg 20

Students` laboratory	160 working places
Research laboratory	55 working places

Marulićev trg 19	
Students` laboratory	62 working places
Research laboratory	19 working places
Vukotinovićeva cesta 2	
Students` laboratory	10 working places
Research laboratory	6 working places
Savska cesta 16	
Students` laboratory	78 working places
Research laboratory	21 working places

c) computer class-room Marulićev trg 20 — 8 working places
computer class-room Savska cesta 16 — 16 working places

Faculy has over 300 computers networked over servers marie and pierre and placed on Marulićev trg 20 and in Savska cesta 16.

d) offices of Faculty teachers and cooperators are on Marulićev trg 20, Marulićev trg 19, Savska cesta 16, Ilica 36, Ilica 53 and Vukotinovićeva 2.

e) library information center (LIC)
Library with its book totals covers the area of Chemical Engineering, Chemistry, Physics, Mathematics and Science of Environment.
Periodicals (about 330 titles, 75 of which are in LIC) while monographs (about 22000) from the specialized areas of computer sciences are processed in placed in the corresponding Departments at the Faculty.

INSTRUMENTS

Potentiostat/galvanostat, Solartron SI 1287
Fequency analyzer, Solartron SI 1260
Electrochemical crystal nanoquartz balance
Potentiostat/galvanostat, Elchema PS-205B
Potentiostat/galvanostat, Ametek 273A
Potentiostat/galvanostat, Ametek 263A
Fequency analyzer, Ametek FRD 1025
Optical microscope Olympus SZH10
Potentiostat/galvanostat, EG&G PAR model 273
Fequency analyzer, EG&G PAR model 5301 "lock-in" amplifier
Bipotentiostat/galvanostat, Elektrolab BPG-200
Rotating ring-disc electrode, Tachyprocesseur Radiometer Analytical
Differential Scanning Calorimeter
Dynamic Mechanical Analyzer
Rotational Viscosimeter
Equipment for accelerate ageing; High pressure Quartz mercury vapour lamp
FTIR spectrophotometer Perkin Elmer Spectrum One
UV chamber SUN-TEST CPS HEREUS 7281785 6259
Thermostatic chamber Memmert
Ozone generator MIC System Inc

Liquid chromatography Shimadzu
Spectral photometer SPEKOL 210 MA-9525 4581
Organic halide analyzer Dohrman
Apparatus TOC -total organic carbon analyzer
UV/VIS spectrophotometer
Photoreactor
Apparatus for ASTM distillation
Apparatus for determination of aniline point
Apparatus for determination of inflammation point
Abbe refractometer
Apparatus for determination of mechanical properties of materials
Apparatus for determination of impact strength
Apparatus for preparation of test specimens for mechanical studies
Apparatus for reverse osmosis and membrane testing (self-made)
Carbon Analyser
Contact Angle Measuring System, OCA 20, DataPhysics
Universal Testing Machine
Spectrophotometer, UV-1601, Shimatzu
Bioreactor, Biostat MD
Electrophoresis system, E-100
Electrodialysis system, Type 02
HPLC, Sykam
Gas Chromatograph, Siemens
High Pressure Reactor (Parr)
Gas Chromatograph (VARIAN 3300)
pH-meter INOLAB-LEVEL
Hydrogen generator (Packard)
Pulse Chemisorb 2700 (Micromeritics)
Ultraviolet spectrophotometer (Pye UNICAM)
Ion Chromatograph, Dionex, model DX 600
High Performance Liquid Chromatograph, Varian, ProStar,
CAMAG TLC Scanner II
Atomic Absorbent Spectrometer, Perkin Elmer 37
Flame photometer Model III, Carl Zeiss, Jena
Spectrophotometer, Perkin Elmer 124
Spectrophotometer, MA 9525-SPEKOL 210,
Spectrophotometer, Perkin Elmer, Lambda 1,
Digital pION metar, E940, Orion Research
Digital pION metar, 801/A, Orion Research
Microwave Accelerated Reaction System for Extraction and Digestion, Varian, MARS X,
Ion coupled plasma – mass spectrometer
Gas chromatograph - mass spectrometer
UV-Vis spectrophotometer Varian DMS-80
UV-Vis spectrophotometer Varian Cary 100
Polarograph Potentiostat/Galvanostat PAR 263A
Spectrophotometer HACH DR/2400
SRI 8610C Gas Chromatograph,
Buck scientific Inc
Composting bioreactor with mechanical agitation and forced aeration
Microscope OLYMPUS BX50
Kjeltec 2100 Distillation Unit with 2006 Digestion System

ASAP Micromeritics – instrument for specific surface and pore size distribution determination
RHEOMETER BROOKFIELD DVIII+
COULTER COUNTER ZM – instrument for particle size distribution determination
Varian Cary 50 Scan UV-Visible Spektrophotometer
UV Perkin Elmer Double Beam Spectrophotometer 124
Varian CARY ECLIPSE Fluorescence Spectrophotometer
IR-Perkin Elmer M-297 Spectrophotometer
IR-Perkin Elmer M-137 Spectrophotometer
GC-MS (Varian CP-3800 Gas Chromatograph-Varian Saturn 2200)
Varian NMR EM360L Netzch, STA409 simultaneous thermal analyser (DSC/TGA)
Netzch, DSC200 thermal analyser (DSC)
Phillips, powder X-ray diffractometer
Fritsch, Pulverisette 6, planetary mill

SCIENTIFIC PROJECTS

Number	Senior Researcher	Project Title
0125002	Tomislav Matusinović , PhD	Development of Hydration Process Model
0125003	Mladen Mintas, PhD	Development of new Therapeutical and Diagnostic Substances for Gene Therapy of Cancer
0125004	Marija Šindler, PhD	Synthesis, Photochemistry and Structure Studies of Heterocyclic Compounds
0125005	Grace Karminski-Zamola, PhD	New Heterocycles; Synthesis, Antitumor and Antiinfectiv Activity
0125007	Vesna Volovšek, PhD	Physical Properties of Partially Ordered Molecular Systems
0125009	Rajka Budin, PhD	Promoting Energy Efficiency in Industry Sector
0125010	Ljerka Duić, PhD	Electrochemical Investigation of Conducting Polymers
0125011	Mirjana Metikoš-Huković, PhD	New Materials and Catalysts for Sustainable Technology
0125012	Ema Stupnišek-Lisac, PhD	New Non-Toxic Corrosion Inhibitors for Metals
0125013	Vera Kovačević, PhD	Particulate Filled Microcomposites, Nanocomposites and Polymer Blends
0125014	Sanja Martinez, PhD	Experimental Investigation and Calculus Models in Corrosion Protection Systems
0125016	Štefica Cerjan-Stefanović, PhD	Ionic Changes and Membrane Processes in Water Treatment for Chemical Industry
0125017	Laszlo Sipos, PhD	Development and Investigation of Complex Methods of WaterTreatment
0125018	Natalija Koprivanac, PhD	Advanced Oxidation Processes for Reduction Waste of Organic Chemical Industry
0125019	Helena Jasna Mencer, PhD	Novel Materials for Specific Purposes

0125020	Zvonimir Janović, PhD	Processes of Frec Radical Polymerization
0125054	Stjepan Milardović, PhD	Development of an Amperometric Biosensor for Determination of Total Plasma Antioxidans
0125055	Marija Kaštelan-Macan, PhD	Chemometric Optimization and Evaluation of Separation Parameters

TECHNOLOGICAL PROJECTS

Number	Coordinator	Project
TP-01/0125-01	Marija Kaštelan-Macan, PhD	Improvement of Pharmaceutical Product Quality
TP-01/0125-02	Štefica Cerjan-Stefanović, PhD	New View of Natural Zeolites from Donje Jesenje
TP-01/0125-03	Stjepan Milardović, PhD	The equipment for Measuring the Concentration of Electrolytes, Glucose and Lactates in Serum and Blood
TP-01/0125-05	Natalija Koprivanac, PhD	AOP in Treatment of Industrial Waste Water
TP-01/0125-06	Laszlo Sipos, PhD	Arsene Removement from Underground Water in Slavonien, According to Recommendation of EC
TP-01/0125-08	Zvonimir Janović, PhD	Polimeric Rheological Modificators
TP-01/0125-09	Tomislav Matusinović, PhD	New Cement Materials
TP-01/0125-10	Vera Kovačević, PhD	Microcomposites and nanocomposites in adhesion products
TP-03/0125-24	Stanislav Kurajica, PhD	Transparent nanocrystalinic glass-ceramic

Lecturer data

Lecturer data	
Surname, Name	**PhD. Marija Kaštelan-Macan, full professor**
E-mail adress	mmacan@fkit.hr
Course	**0.1. CHEMICAL ANALYSIS IN QUALITY SYSTEM**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marija Kaštelan Macan was born at Dubrovnik, Croatia 23. V. 1939. Graduated 1957. from V. secondary school in Zagreb, diploma University of Zagreb, Faculty of Technology 1962., Master's degree 1968., PhD 1973. Thesis: "Theorethical considerations of thin-layer chromatographic process".
At Faculty of Technology (from 1991. Faculty of Chemical Engineering and Technology) assistant 1963.-75, assistant professor 1975.-82., associated professor 1982.-88., university professor from 1987.-, dean 1991.-93.
Subjects: Quality testing, Environmental analytical chemistry, Quality assurance (undergraduate studies); Chromatographic analysis of environment, Quality assurance of analytical system, Chemical wastewater treatment (graduated studies).
Research area: analytical chemistry, specially chromatography and enviromental protection.
Published 75 scientific conributions, about 50 professional and popularizing papers in journals and monographies and 6 books.

Date of last election
12.01.1999.

Referent publications of lecturer

1. M. Petrović, M. Kaštelan-Macan, D. Ivanković, S. Matečić. Video-Densitometric Quantitation of Flurescence Quencing on Totally Irradiated Thin-Layer Chromatographic Plates. *J. AOAC Int*. 83 (2000) 1457-1462.
2. M. Petrović, M. Kaštelan-Macan, K. Lazarić, S. Babić, Validation of TLC Quantitative Determination With CCD Camera and Slit-Scanning Densitometer, *J. AOAC Int*. 82 (1999) 25-30.
3. M. Petrović, S. Babić, M. Kaštelan-Macan. Quantitative Determination of Pesticides in Soil by Thin-layer Chromatography and Video Densitometry, *Croat. Chem. Acta* 73 (2000) 197-207.
4. M. Petrović, M. Kaštelan-Macan, Validation of the Quantitative Chromatographic Analysis on Laboratory Prepared Thin Layers, *J. Chromatogr. A*, 704 (1995) 173-178.
5. S. Turina, M. Trbojević, M. Kaštelan-Macan, Determination of Optimal Solvent Composition in Thin Layer Chromatography by Means of Numerical Analysis, *Anal. Chem.* 46 (1974) 988.

Lecturer data	
Surname, Name	**PhD. Štefica Cerjan- Stefanović, full professor**
E-mail adress	scerjan@fkit.hr
Course	**0.2. CHEMISTRY OF WATER**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Štefica Cerjan-Stefanović was born 19. September 1939. in Zagreb, Croatia. B.C.E. 1963, M.Sc. 1968. and Ph.D**.:** 1973. on Faculty of Technology, University of Zagreb, Mentor: Ph.D. Vjera Marjanović - Krajovan, professor, "Distribution of some chemical elements in iron materials".
Work experience: Since 1. December 1963. work at Laboratory for Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, as follows: assistant 1975. - 1977.; Docent 1977.-1983.; professor since 1983.
Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph.D. I. Incedya, professor.
Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia.
Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ.
Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph.D. I. Incedya, professor. Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia. Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ.

Date of last election
10.11.1998.

Referent publications of lecturer

1. Ž. Grahek, S. Lukić, K. Košutić, I. Eškinja, Š. Cerjan-Stefanović, Separation of Radioactive Stroncium from Natural Samples by means of Mixed-solvent Anion Exchange, *J Radioan Nucl Ch Ar*, 189 (1995) 140.
2. S. Leaković, I. Mijatović, Š Cerjan-Stefanović, E. Hodžić, Nitrogen removal from fertilizer wastewater by ion exchange, *Water Res*, 34 (2000) 185-190.
3. M. Rožić, Š. Cerjan-Stefanović, S. Kurajica, V. Vančina, E. Hodžić, Ammoniacal nitrogen removal from water by treatment with clays and zeolites, *Water Res*, 34 (2000) 3675-3681.
4. Š. Cerjan–Stefanović, T. Bolanča, L. Ćurković, Simultaneous Determination of six Inorganic Anions in Drinking Water by Non-Suppressed Ion Chromatography, *J Chromatogr A*, 918 (2001) 325-334.
5. G. Srečnik, Ž. Debeljak, Š. Cerjan–Stefanović, M. Nović, T. Bolanča, Optimization of Artificial Neural Networks Used for Retention Modelling in Ion Chromatography, *J Chromatogr A*, 973 (2002) 47-59.

Lecturer data	
Surname, Name	**PhD. Laszlo Sipos, full professor**
E-mail adress	lsipos@fkit.hr
Course	**0.3. WATER TREATMENT PROCESS DESIGN**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Laszlo Sipos was born 1943 in Bečej. Received BSc 1997, MSc 1970 and PhD 1974 at the University of Zagreb. Began his work at the Center for Marine Research, Institute "Ruđer Bošković" in Zagreb (1967-1982). Subsequently, he worked at the Faculty of Civil Engineering University of Zagreb (1982-1988). Since 1988 he is professor of General and Inorganic Chemistry at the Faculty of Chemical Engineering and Technology University of Zagreb. He was on leave for ten months (1969/70) at the University of Warsaw, Poland, and three years (1975-1978), at the Nuclear Research Center (KFA) in Jülich, F.R. Germany. His scientific interest is study of electrochemical redox processes, development and application of electroanalytical techniques for determination and characterization of trace metals in aquatic environment as well as development, scale up and application of water treatment processes.

Date of last election
14.09.2004.

Referent publications of lecturer

1. T. Štembal, M. Markić, N. Ribičić, F. Briški and L. Sipos. Removal of Ammonia, Iron and Manganese from Ground Waters of Northern Croatia – Pilot-Plant Studies, *Process Biochem*. 40 (2005) 327-335.
2. T. Štembal, M. Markić, F. Briški and L. Sipos. Rapid Start-Up of Biofilters for Removal of Ammonium, Iron and Manganese from Ground Water. *J. Water. Supply. Res. T.* 53 (2004) 509.
3. van Loosdrecht, M., Barcelo, D., Benfenati, E., Bianchedi, R., Coccagna, L., Fernex., F., Maslejova, A., Ramadori, R., Rindone, B. Sipos, L.: Urban and Industrial Waste Water, In: R. Monnanni (Ed.), Deppolution Planning of the Mediterranean Sea (a document eleborated during a workshop held in San Miniato, Pisa, October 22-24, 1992., *Societa Chimica Italiana*, 17-27, 1992.
4. Filipović-Kovačević, Ž., Sipos, L.: Decolorization of Yeast-Production Industry Wastewater by Ozone, *J. Environ. Sci. Heal. A*, A30 (1995) 1515-1522.
5. F. Briški, M Petrović., M. Kaštelan-Macan, L. Sipos. Removal of Humic Substances from Aqueous Solution by Fungal Pellets, *Biocatalysis* 10 (1994) 1-14.

Lecturer data	
Surname, Name	**PhD. Hrvoje Ivanković, associate professor**
E-mail adress	hivan@fkit.hr
Course	**0.4. INORGANIC NON-METALLIC MATERIALS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Hrvoje Ivanković: Education: B.Sc. 1982., M.Sc. 1990. and Ph.D. 1997. , University of Zagreb, Faculty of Chemical Engineering and Technology.
Research stays: From 1991.-1995. Institutu fuer Neue Materialien, Saarbruecken, Germany.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1997-2002.); Associate Professor (2002)
Main research topics: solid state kinetics, ceramic and glass-ceramics microstructure and properties, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Publications: author and co-author of 30 scientific papers.
Membership: Croatian Society of Chemical Engineers, Croatian Society for Materials and Tribology, Croatian Crystallographic Society.

Date of last election
23.09.2002.

Referent publications of lecturer

1. E. Tkalčec, H. Ivanković, R. Nass, H. Schmidt, Crystallization kinetics of mullite formation in diphasic gels containing different alumina components, *J. Eur. Ceram. Soc.,* 23 (2003), 1465.
2. H. Ivanković, E. Tkalčec, R. Nass, H. Schmidt, Correlation of the precursor type with densification behavior and microstructure of sintered mullite ceramics, *J. Eur. Ceram. Soc.,* 23 (2003), 283-292.
3. H. Ivanković, S. Kurajica, E. Tkalčec, The influence of B2O3 on the crystallization kinetics in zinc-aluminosilicate glasses, *Glass Science & Technology*, 75 (Suppl S): 2002, 314-317.
4. E. Tkalčec, S. Kurajica, H. Ivanković, Isothermal and non-isothermal crystallization kinetics of zinc-aluminosilicate glasses, *Termochim. Acta*, 378 (2001), 135.
5. J. Macan, H. Ivanković, M. Ivanković, H. J. Mencer, Synthesis and Characterization of Organic-Inorganic Hybrids Based on Epoxy Resin and 3-Glycidyloxypropyltriethoxysilane, J. Appl. Polym. Sci. 92 (2004) 498-505.

Lecturer data	
Surname, Name	**PhD. Stanislav Kurajica, associate professor**
E-mail adress	stankok@fkit.hr
Course	**0.5. HIGH-TEMPERATURE REACTIONS MECHANISMS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Stanislav Kurajica was born in Dubrovnik on December, 24. 1965. He accomplished primary and secondary education in Dubrovnik. In period 1985. to 1991. he studied Chemical technology at Faculty of technology of University of Zagreb. In 1995. he recieved Ms degree and 1998. PhD degree at Faculty of Chemical Engineering and Technology, University of Zagreb. From 1991. he works at Department of inorganic chemical technology and non-metals of the Faculty of Chemical Engineering and Technology in Zagreb. In 1999. he was appointed at assistant professor position. Scientific activity of S. Kurajica is focused on solid-state reactions and kinetics, new ceramic and glass-ceramic materials and cement. At present he is teaching courses: Reactions in the solid state, The chemistry of silicates and Water treatment processes. S. Kurajica published 18 scientific papers, 13 of them in international journals and participated in five scientific ant technological projects.

Date of last election
21.06.2004.

Referent publications of lecturer

1. S. Kurajica, A. Bezjak, R. Tkalčec. "Resolution of Overlapping Peaks and the Determination of Kinetic Parameters for the Crystallization of Multicomponent System from DTA or DSC Curves: I Non-Isothermal Kinetics". *Thermochim. Acta* 288 (1996) 123.
2. E. Tkalčec, R. Nass, J. Schmauch, H. Schmidt, S. Kurajica, A. Bezjak, H. Ivanković. "Crystallization Kinetics of Mullite from Single-Phase Gel Determined by Isothermal Differential Scanning Calorimetry". *J. Non-Cryst. Solids* 223 (1998) 57.
3. S. Kurajica, A. Bezjak, R. Tkalčec. "Resolution of Overlapping Peaks and the Determination of Kinetic Parameters for the Crystallization of Multicomponent System from DTA or DSC Curves: II Isothermal Kinetics". *Thermochim. Acta*, 360 (2000) 63.
4. A. Bezjak, S. Kurajica, J. Šipušić. "A new Approach to Solid-State Reactions Kinetics Analysis: the Application of Assisting Functions to Basic Equations for Isothermal Conditions". *Thermochim. Acta*, 386 (2002) 81.
5. S. Kurajica, J. Schmauch, E. Tkalčec. "Application of Numerical Method for the Analysis of Metglas 2826 MB Crystallization Kinetics". *CCACAA* 75 (2002) 693.

Lecturer data	
Surname, Name	**PhD. Helena Jasna Mencer, full professor**
E-mail adress	hjmencer @fkit.hr
Course	**0.6. PHYSICO-CHEMICAL PRINCIPLES IN POLYMER SYSTEMS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Helena Jasna Mencer: *Education:* B.Sc. 1966., M.Sc. 1973. and Ph.D. 1976., University of Zagreb, Faculty of Technology . *Employment and duties*: From 1966.-1971, assistant collaborator at the Institute of Chemical Technology, University of Zagreb,1971-1978, assistant at the Faculty of Technology, University of Zagreb, 1978-1986, assistant professor ,1986-1991. associate professor at the Faculty of Technology, University of Zagreb, 1992- full professor at the Faculty of Chemical Engineering and Technology, University of Zagreb. 1993. –1994. Vice dean of the Faculty of Chemical Engineering and Technology, 1994. - 2002. Vice rector of the University of Zagreb. 2002-Rector of the University of Zagreb.
Specialization: Center de recherches sur les macromolecules, Strasbourg, France (1978-1979), Technical University, Eindhoven, the Netherlands (1991.), Catholic University Leuven, Belgium (1992).
The main fields of research interest are physical chemistry of polymers, thermodynamics of polymer solutions, polymerization engineering, materials engineering.
Current scientific project: Novel Materials for Specific Purposes
*Publications:*author and co-author of 70 scientific and professional papers.
Membership: Croatian Society of Chemical Engineers, Society of Plastic and Rubber Engineers, Scientific Council for Petroleum of Croatian Academy of Arts and Sciences (HAZU), European Polymer Federation.
Awards: «Fran Bošnjaković» Award by the University Senat, Zagreb, 1995; Society of Plastic and Rubber Engineers Diploma, Zagreb,1995; «Priroda» Journal Award by the Croatian Natural Science Society, 1994.

Date of last election
16.09.1997.

Referent publications of lecturer

1. Mencer HJ, Gomzi Z. Modeling of transport phenomena-Column fractionation effected by simultaneous solvent and temperature gradient. *J Polym. Eng*. 16 (1997) 87-103.
2. Rogošić M, Mencer HJ. Prediction of copolymer miscibility by the viscometric method. *Eur. Polym. J*. 33 (1997) 621-630.
3. Andreis M, Rakvin B, Veksli Z, Rogošić M, Mencer HJ. An electron spin resonance study of molecular dynamics and heterogeneity in the styrene-acrylonitrile copolymers. *Polymer* 40 (1999) 1955-1960.
4. Pintarić B, Rogošić M, Mencer HJ. Dilute solution properties of cellulose diacetate in mixed solvents. *J Mol. Liq*., 85 (2000) 331-350.
5. Rogošić M, Gusić I, Pintarić B, Mencer HJ. The ellipsoidal model of the solubility volume. *J. Mol. Liq.* 108 (2003) 135-150.

Lecturer data	
Surname, Name	**PhD. Marica Ivanković, associate professor**
E-mail adress	mivank@fkit.hr
Course	**0.6. PHYSICO-CHEMICAL PRINCIPLES IN POLYMER SYSTEMS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marica Ivanković Education: B.Sc. 1985., M.Sc. 1988. and Ph.D. 1994., University of Zagreb, Faculty of Chemical Engineering and Technology .
Research stays: From 1991.-1993. Universita degli Studi di Napoli, Dipartimento di Ingegneria dei Materiali e della Produzione, Italy.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1995-2000.); Associate professor (2000-)
Main research topics: thermodynamics of polymer solutions, curing kinetics and chemoreology of thermosets and thermoset matrix composites, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Membership: Croatian Society of Chemical Engineers, Society of Plastic and Rubber Engineers, Croatian Society for Materials and Tribology, Scientific Council for Petroleum of Croatian Academy of Arts and Sciences (HAZU).

Date of last election
25.09.2000.

Referent publications of lecturer

1. Ivanković M., Džodan N., Brnardić I., Mencer HJ. DSC Study on Simultaneous Interpenetrating Polymer Network Formation of Epoxy Resin and Unsaturated Polyester. *J. Appl. Polym. Sci.,* 83 (2002) 2689-2698.
2. Ivanković M., Incarnato L., Kenny JM, Nicolais L. Curing kinetics and chemorheology of epoxy/anhydride system. *J. Appl. Polym. Sci.,* 90 (2003) 3012-3019.
3. Macan J., Ivanković H, Ivanković M, Mencer HJ, Synthesis and characterization of organic-inorganic hybrids based on epoxy resin and 3-glycidyloxypropyltrimethoxysilane. *J. Appl. Polym. Sci.,* 92 (2004) 498-505.
4. Macan J, Ivanković H, Ivanković M., Mencer HJ. Study of cure kinetics of epoxy-silica organic-inorganic hybrid materials. *Thermochimica Acta*, 414 (2004) 219-225.

Lecturer data	
Surname, Name	**PhD. Zorica Veksli, full professor**
E-mail adress	zveksli@irb.hr
Course	**0.7. RELAXATION PROCESSES IN POLYMERS**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Zorica Veksli graduated in 1960. at the Faculty of Technology, University of Zagreb, M.sc. (1964.) and Ph.D. (1967.) both in chemistry at the Faculty of natural sciences, University of Zagreb.From 1960. employed at the Rudjer Boskovic Institute.
1968/69. is a visiting scientist at the Unilever research laboratory, England and from 1973. to 1976. postdoctoral fellow at the University of Minnesota, Minneapolis, USA. Since 1990. friquent visits to the Institute Charles Sadron in the frame of bilateral collaboration with France. From 1976. head of the Laboratory of magnetic resonances until the retirement in 2002. Full professor of chemistry at the Faculty of natural sciences, Department of chemistry since 1997.
Awards for scientific achievements: Croatian academy of sciences and arts award in the field of natural sciences and mathematics (2000.) and State award in the field of natural sciences (2000).
Field of research: Structure and dynamics of polymers: matrix morphology, phase composition of polymers, copolymers, interpenetrating networks and polymer mixtures; structure-property relationship. Application of magnetic resonance methods (ESR, DMESR, NMR).

Date of last election

Referent publications of lecturer

1. Z. Veksli, M. Andreis, B. Rakvin: ESR Spectroscopy for the Study of Polymer Heterogeneity. *Prog. Polym. Sci.* 25 (2000) 949-986.
2. J. Čulin, D. Gembarovski, M. Andreis, Z. Veksli, T. Marinović: Effect of Thermal Oxidative Aging on the Morphology of Natural Rubber Networks as Viewed by ESR. *Polym. Int.* 49 (2000) 845-852.
3. J. Čulin, S. Frka, M. Andreis, I. Šmit, Z. Veksli, A. Anžlovar, M. Žigon: Motional heterogeneity of segmented polyurethane-polymethacrylate: An influence of functional groups concentration. *Polymer* 43 (2002) 3891-3899.
4. J. Čulin, Z. Veksli, A. Anžlovar, M. Žigon. Spin probe study of semi-interpenetrating polymer networks based on polyurethane and polymethacrylate functional polymers. *Polym. Int.* 52 (2003) 1346-1350.
5. J. Čulin, M. Andreis, Z. Veksli, Y. Gallot. Motional heterogeneity of polystyrene-*block*-polybutadiene: a spin probe study. *Polymer* 44 (2003) 7875-7881.

Lecturer data	
Surname, Name	**PhD. Grace Karminski-Zamola, full professor**
E-mail adress	gzamola@fkit.hr
Course	**0.8. HETEROCYCLES IN BIOMOLECULES AND INDUSTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Grace Karminski-Zamola was born in Zagreb, 1940. Completed secondary schooling in Zagreb 1958. Graduated on the Faculty of Technology in Zagreb 1962. Win a master's degree on the Faculty of Natural Sciences and Mathematics in Zagreb 1969. Got her's doctor's degree on the Faculty of Technology in Zagreb 1972 on the field of Organic Chemistry. Appointed as university assistant 1962. Promoted into the assistant professor 1975, into associate professor in 1986, into full professor 1996 and permanent full professor into 2000 year. She is teaching Organic Chemistry, Design of Organic Organic Chemical Synthesis, Synthetic Drugs on the graduate study on the Faculty of Chemical Engineering and Technology in Zagreb and Heterocycles in biomolecules and Industry, Chemistry of Nonnucleoside Antineoplastics on the postgraduate study on Faculty of Chemical Engineering and Technology in Zagreb and Organic Photochemistry on the Faculty of Natural Sciences and Mathematics in Zagreb.

Under the mentorship of the prof. G. Karminski-Zamola is made more than sixty diploma thesis, more master of science and doctor's thesis.

Scientific work includes the field of synthetic organic chemistry, synthetic photochemistry: synthesis and photochemical synthesis of heterocyclic compounds from furan, thiophene, benzimidazole, benzthiazole, quinolone series and their derivatives like carboxylic acids, amides, amidines and bis amidines, chemistry of dibenzosuberones and microcyclic antibiotics. She is studing antiinfective and antitumor activity of heterocyclic compounds as well as the mechanism of action.

She is the author of more than sixty scientific papers, from which 54 are cited in Current Contents a few professional papers and a few patents. She is the coordinator of more national and international scientific projects.

Date of last election

01.02.2000.

Referent publications of lecturer

1. I. Ćaleta, M. Cetina, A. Hergold-Brundić, A. Nagl and G. Karminski-Zamola, Synthesis and Crystal Structure determination of 6-(N-Isopropyl)Amidino-2-Methylbenzothiazole Hydrochloride Monohydrate and 2-Amino-6-(N-Isopropyl)Amidinobenzothiazole Hydrochloride, Struct. Chem. 14, (2003), 587-595.
2. D Matković-Čalogović, Z. Popović, V. Tralić-Kulenović, L. Racané, G. Karminski-Zamola. 1, 3-Benzothiazole-6-carboxamidinium chloride dihydrate. Acta Crystallographica Section C Crystal Structure Communications. C 59 (2003) 0190-0191.
3. L. Racane, V. Tralic-Kulenovic, D. W. Boykin, G. Karminski-Zamola. Synthesis of New Cyano-Substituted bis-Benzothiazolyl Arylfurans and Arylthiophenes. Molecules. 8 (2003) 4; 342-349.
4. K. Starčević, W. D. Boykin, G. Karminski-Zamola. New Amidino-benzimidazolyl Thiophenes; Synthesis and Photochemical Synthesis. Heteroatom Chemistry. 14, (2003) 3; 218-222.
5. V. Tralić-Kulenović, L. Racane, G. Karminski-Zamola. "Absorptions and Fluorescence Properties of Some Substituted 2-Furylbenzothiazoles and Their Vinylogues in Different Solvents". Spectroscopy Letters. 36, (2003) 1&2; 43-50.

Lecturer data	
Surname, Name	**PhD. Marija Šindler, full professor**
E-mail adress	msindler @fkit.hr
Course	**0.9. PRINCIPLES AND APPLICATION OF ORGANIC PHOTOCHEMISTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marija Šindler (born Kulyk) - Bachelor: 1964. Faculty of Technology, University of Zagreb, Croatia Master: 1970. Faculty of Natural Sciences and Mathematics, University of Zagreb, and Ph. D.: 1976. Faculty of Science in Nijmegen (Netherlands).
Education and specialisation: 1973 – 1976. Ph.D. study at Katholieke Universiteit Nijmegen (Nijmegen, Netherlands), photochemistry of vinylstylbenes. 1979 – 1982. Postdoctoral fellow at Bowling Green State University (Ohio, USA), organic photochemistry of heterocycles (with Prof. Dr D. C. Neckers on the project: Photochemistry of benzothiazoles and benzisothiazoles in the presence of alkenes and alkynes - Photochemical intermolecular cycloadditions). 23.9. -29.9.1991. One-week collaboration at Universite Catholique de Louvain in Louvain-La-Neuve (Belgium) financed from EC as TEMPUS program Action 2 Individual Mobility Grants.
Employment: Since 1965. at the Faculty of Chemical Engineering and Technology (former Faculty of Technology), Department of Organic Chemistry, Marulićev trg 20, 10000 Zagreb, and full professor is since 01.02.2000.
Research interest: Synthesis and photochemistry of selected cyclic and heterocyclic unsaturated systems with particular emphases on the study of intra- and intermolecular cycloaddition reactions and rearrangement reactions in ground and excited states; synthesis of the potentially biologically active compounds; synthesis of new heterocyclic modifications of macrolide antibiotics.

Memberships: EPA (European Photochemistry Association), ISHC (International Society of Heterocyclic Chemistry), HKD (Croatian Chemical Society), HDKIT (Croatian Society of Chemical Engineers); Member of the Editorial board of Croatica Chemica Acta (CCA, since 1994-)

Date of last election

01.02.2000.

Referent publications of lecturer

1. N. Basarić, Ž. Marinić, M. Šindler-Kulyk: "New photoinduced Intramolecular Ring Closure to a Benzopentaleno-pyrrole Derivative from 5, 5′-Dimethyl-2, 2′-(*o*-phenylenedivinylene)dipyrrole", *Tetrahedron Letters*, 42 (2001) 3641-3643.
2. N. Basarić, Ž. Marinić, A. Višnjevac, B. Kojić-Prodić, A. G. Griesbeck, M. Šindler-Kulyk: "Photochemical transformations of 2, 2'-(1, 2-phenylenedivinylene)dipyrroles", *Photochem. Photobiol. Sciences*, 1 (2002) 1017-1023.
3. N. Basarić, D. Iveković, B. Zimmermann, Ž. Marinić, K. Kowski, P. Rademacher, M. Šindler-Kulyk: "Structure elucidation of the photoproducts obtained by the photolysis of *N*-acetyl-2-styrylpyrroles", *J. Photochem. Photobiol., A: Chem.,* 154 (2003) 123-130.
4. N. Basarić, Ž. Marinić, M. Šindler-Kulyk: "Photochemical Formation of Novel Pyrrolo[3, 2-*b*]-6, 7-benzobicyclo[3. 2. 1]octa-2, 6-diene", *J. Org. Chem.,* 20 (2003) 7524-7527.
5. N. Basarić, Ž. Marinić, M. Šindler-Kulyk, "Photochemistry of stilbenyl-pyrroles: A new approach to indole and isoindole derivatives", *Tet. Letters*, 44 (2003) 7337-7340.

Lecturer data

Surname, Name	**PhD. Mladen Mintas, full professor**
E-mail adress	mmintas@fkit.hr
Course	**0.10. STRATEGY OF ORGANIC SYNTHESIS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Mladen Mintas, was born on August 22. 1943. in Varaždin, Croatia. Since 1993 is full professor (permanent position) of Chemistry at the Laboratory of Organic Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia. *Education:* B. Sc. Degree, Technological Faculty, University of Zagreb (1968); M.Sc. Degree (Faculty of Pharmacy and Biochemistry, University of Zagreb, 1972) and Ph.D. Degree at the University of Zagreb in 1976. *Postdoctoral specialization*: University of Regensburg, Germany (1977-1979) and Nuclear Research Center Karlsruhe, Germany (1979-1980). *Visiting professorship*: New York University, New York, N.Y., USA, 1987-1988 and ETH Zürich, Department Pharmazie, 1999-2000. He has published 70 scientific papers (*CC*, *SCI*) and two university text books on drugs. *Research field*: Development of new pharmacologically active compounds, particularly the leading compounds with antiviral and cytostatic activities. He has been involved for many years in international collaborative research projects.

Date of last election
10.11.1998.

Referent publications of lecturer

1. S. Raić-Malić, L. Tomašković, D. Mrvoš-Sermek, B. Prugovečki, M. Cetina, M. Grdiša, K. Pavelić, A. Mannschreck, J. Balzarini, E. De Clercq i M. Mintas. Spirobipyridopyrans, Spirobinaphthopyrans, Indolinospiropyridopyrans, Indolinospironaphthopyrans and Indolinospironaphtho-1, 4-oxazines: Synthesis, Study of X-Ray Crystal Structure and Antitumor Activities. Bioorg. Med. Chem. 12 (2004) 1037-1045.
2. M. Cetina, Z. Džolić, D. Mrvoš-Sermek, A. Hergold-Brundić, A. Nagl, M. Mintas. Synthesis and X-ray study of the 6-(N-pyrrolylpurine) and thymine derivatives of 1-aminocyclopropane-1-carboxylic acid. J. Peptide Res. 63 (2004) 391-398.
3. S. Prekupec, D. Svedružić, T. Gazivoda, D. Mrvoš-Sermek, A. Nagl, M. Grdiša, K. Pavelić, J. Balzarini, E. De Clercq, G. Folkers, L. Scapozza, M. Mintas i S. Raić-Malić. Synthesis and Biological Evaluation of Iodinated and Fluorinated 9-(2-Hydroxypropyl) and 9-(2-Hydroxyethoxy)methyl Purine Nucleoside Analogues. J. Med. Chem. 42 (2003) 5763-5772.
4. Z. Džolić, V. Krištafor, M. Cetina, A. Nagl, A. Hergold-Brundić, D. Mrvoš-Sermek, T. Burgemeister, M. Grdiša, N. Slade, K. Pavelić, J. Balzarini, E. De Clercq and M. Mintas. Synthesis, Structural Studies and Biological Evaluation of Some Purine Substituted 1-Aminocyclopropane-1-carboxylic Acids and 1-Amino-1-hydroxymethylcyclopropanes. Nucleosides, Nnucleotides & Nucleic Acids 22 (2003) 373-389.
5. P. Pospisil, B. D. Pilger, S. Marveggio, P. Schelling, C. Wurth, M. Pongračić, M. Mintas, S. Raić-Malić, G. Folkers, L. Scapozza. 9-(2-Hydroxypropyl)adenine a Novel Fraudulent Substrate of HSV1-Thymidine Kinase. An Interdisciplinary study. Helv. Chim. Acta. 85 (2002) 3237-3250.

Lecturer data

Surname, Name	**PhD. Vladimir Dananić, assistant professor**
E-mail adress	vdanan@fkit.hr
Course	**0.11. SOLID STATE PHYSICS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Vladimir Dananić - Doctoral thesis in physics, University of Zagreb, Faculty of Natural Sciences, Zagreb, 1996. Degree of Master of Science, University of Zagreb, Faculty of Natural Sciences, Zagreb 1987. Diploma of B.S., University of Zagreb, Faculty of Natural Sciences, Zagreb, 1984.Employments: Assistant Professor at Faculty of Chemical Engineering and Technology, University of Zagreb, 2000.- Senior Assistant at Faculty of Chemical Engineering and Technology, University of Zagreb, 1997.-2000. Assistant at Faculty of Chemical Engineering and Technology, University of Zagreb, 1989.-1997.
Assistant at Faculty of Natural Sciences, University of Zagreb, 1985.-1989.

Date of last election
29.01.2001.

Referent publications of lecturer

1. V. Dananić, A. Bjeliš, M. Rogina and E. Coffou, *Phys. Rev. A* 46 (1992) 3551.
2. V. Dananić and A. Bjeliš, *Phys. Rev. E* 50 (1994) 3900.
3. V. Volovšek, D. Kirin, V. Dananić, *J. Mol. Struc.* 349 (1995) 369.
4. L. Kaštelan-Kunst, V. Dananić, B. Kunst and K. Košutić, *J. Membrane Sci.* 109 (1996) 223.
5. V. Dananić and A. Bjeliš, *Phys. Rev. Lett.* 80 (1998) 10.

Lecturer data	
Surname, Name	**PhD. Krešimir Furić, senior scientist**
E-mail adress	furic@irb.hr
Course	**0.12. FUNDAMENTALS AND APPLICATIONS OF NANOSTRUCTURES**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Krešimir Furić obtained PhD in 1981 in Zagreb, supervisor Prof. L. Colombo. Since 1970 employed at IRB. Several short visits to universities of Paris (F), Bradford (UK), München (D), Columbia (SC) in the groups well established in the field of vibrational spectroscopy. Principal investigator of former projects "Vibrational phenomena and interactions in condensed matter" and "Scattering of light, interactions and dynamics of matter", and present "Physics and application of nanostructures". Head of the Laboratory for molecular physics, IRB, for many years. Graduate course at the Faculty of Sciences: K. Furić "Selected topics in optics" and seminar. Over 70 papers published in CC journals.
Research fields: Normal mode calculation and vibration spectroscopy of molecules and molecular crystals. Significantly extended activity of the group in methods and subjects such as organic and inorganic materials, even to complex biological and geological systems. Common interest lies in nanostructures (glass and glass ceramics for special applications, metal oxides and sintering, semiconductors, biological agglomerations, water in different environments).

Date of last election
11.05.2004.

Referent publications of lecturer

1. L. Colombo, Z. Meić and K. Furić (Guest editors): Special subject issue on State-of-the-art in vibrational spectroscopy, Croatica Chemica Acta 61 (1988) 189-717.
2. K. Furić, M. Ivanda, J. Kučar Kopić and V. Mohaček: Remarkable increase of organic particles in the atmosphere above Croatia, Spectrochim. Acta 50A (1994) 449-462.
3. M. Metikoš-Huković, K. Furić, R. Babić and A. Marinović: Surface-enhanced Raman scattering (SERS) of benzotriazole derivative corrosion inhibitor prepared in aqueous media, Surface and interface analysis 27 (1999) 1016-1025.
4. I. D. Desnica-Franković, K. Furić, U. V. Desnica, M. C. Ridgway and C. J. Glover: Structural modifications in amorphous Ge produced by ion implantation, Nucl. Instrum. Meth. B 178 (2001) 192-195.
5. V. Bermanec, K. Furić, M. Rajić and G. Kniewald: Thermal stability and vibrational spectra of the sheet borate tuzlaite, $NaCa[B_5O_8(OH)_2]*3H_2O$, American Mineralogist 88 (2003) 271-276.

Lecturer data	
Surname, Name	**PhD. Mile Ivanda, senior research associate**
E-mail adress	ivanda@irb.hr
Course	**0.12. FUNDAMENTALS AND APPLICATIONS OF NANOSTRUCTURES**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Mile Ivanda obtained PhD in 1992 in Zagreb, under the supervision of Dr. K. Furić. Since 1986 has been employed at the Ruđer Bošković Institute. From 1994 to 1996 postdoctoral fellow of Alexander von Humbolt Foundation at the University of Wuerzburg (D). In 2000 year visiting scientist at the University of Trento. Significant number of invited talks at domestic and international conferences presents results of his research. Principal investigator of the technological project: Implementation and Development of the LPCVD Process. Graduate course at the Faculty of Sciences: M. Ivanda "Modern experimental methods in physics". Publish 80 scientific papers (more than 50 in CC journals). Field of research: work on structure and vibration dynamics of disordered materials – amorphous silicon, quartz glass, halcogenide semiconductors and defects in semiconductor materials produced by high energy ion bombardment. Last years his research was oriented to the structure and optoelectronic properties of semiconductor and nano-structured materials and thin semiconductor and oxide films.

Date of last election
21.12.2004.

Referent publications of lecturer

1. M. Ivanda, A.M. Tonejc, I. Djedj, M. Gotić, S. Musić, G. Mariotto, M. Montagna. *Determination of nanosized particles distribution by low freqyency Raman scattering: Comparison to electron microscopy*, In Lecture Notes in Physics: Nanoscale Spectroscopy and Its Applications to Semiconductor Research, Eds.Y. Watanabe, S. Heun, G. Salviati, and N. Yamamoto, Springer Verlag 2002, pp 16-27.
2. M. Ivanda, K. Babocsi, C. Dem, M. Schmitt, M. Montagna, W. Kiefer. Low Wavenumber Raman Scattering From Nanosized CdS_xSe_{1-X} Crystals Embeded In Glass Matrix. *Phys. Rev.* B 67 (2003) 235329-235337.
3. M. Ivanda, U.V. Desnica, C. W. White, W. Kiefer. Experimental Observation of Optical Amplification in Silicon Nanocrystals, Nato Science Series Vol. 93: Towards the First Silicon Laser, pp. 191-196, L. Pavesi, S. Gaponenko and L. Del-Negro (eds.), Kluwer Academic Publishers**,** Netherlands, 2003.
4. M. Ivanda, R. Clasen, M. Hornfeck, W. Kiefer. Raman Spectroscopy on SiO2 Glasses Sintered from Nanosized Particles. *J. Non-Cryst. Solids* 322 (2003) 46-52.

Lecturer data	
Surname, Name	**PhD. Milorad Milun, research professor**
E-mail adress	milun@irb.hr
Course	**0.13. CHEMICAL AND PHYSICAL PROPERTIES OF SURFACES AND NANOSTRUCTURES**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Milorad Milun was born in Zagreb, February 8th, 1947
Education: Graduated study at the University of Zagreb, Faculty of natural sciences and mathematics, Department of chemistry, Physical chemistry; at B.Sc. in 1971. Postgraduate study - Chemistry - Theoretical chemistry, M. Sc. in 1973 at University of Zagreb. Ph.D. in natural sciences, field of chemistry, 1976 at the Faculty of natural sciences and mathematics, University of Zagreb.
Positions: 1971 –1976. Researcher at R&D institute PLIVA, Zagreb; 1976 –1982. Head of the spectroscopy group at R&D institute Chromos; 1982- 1988. Scientific collaborator at the Institute of Physics of the University Zagreb responsible for the experimental surface science laboratory, 1984 – 1990. Head of the Department of metals; 1989 – 1999. Higher scientific collaborator at the Institute of Physics, Zagreb; 1999 - present is Scientific adviser at the Institute of Physics, Zagreb. 1999 – 2001. President of the Scientific Council of the Institute of Physics. 2001 - present is Director of the Institute of Physics, Zagreb.
Awards: Alexander von Humboldt fellow, University of Regensburg 1979, University of Bonn, 1990, 1991
Fullbright fellow, New York University, Physics Dept. 1997/1998

Date of last election

Referent publications of lecturer

1. M. Milun, P. Pervan, B. Gumhalter, D.P. Woodruff, “Photoemission Intensity Oscillations from Quantum Well States in the Ag/V(100) Overlayer System”, Phys. Rev. B, 59 (1999) 5170 – 5177.
2. M. Kralj, A. Šiber, P. Pervan, M. Milun, T. Valla, P.D. Johnson, D.P. Woodruff, “Temperature dependence of photoemission from quantum-well states in Ag/V(100): moving surface-vacuum barrier effects”, Phys. Rev. B 64 (2001) 085411 (9).
3. C. Becker, A Rosenhahn, A Wiltner, K von Bergmann, J Schneider, P Pervan, M Milun, M Kralj, K Wandelt, “Al2O3-films on Ni3Al(111): a template for nanostructured cluster growth”, New J. Phys. 4 (2002) 75.1 – 75.15.
4. M.Jenko B. Erjavec, M. Milun, "High resolution AES analysis and imaging of In20Sn80 oxidized surfaces using field emission Auger microprobe", Vacuum, 71 (2003) 19-25.
5. M. Kralj, P. Pervan, M. Milun, K. Wandelt, D. Mandrino, M. Jenko, "HRAES, STM and ARUPS study of (5×1)reconstructed V(100), Surface Sci. 526 (2003) 166-176.

Lecturer data	
Surname, Name	**PhD. Svetozar Musić, full professor**
E-mail adress	music@irb.hr
Course	**0.14. SPECTROSCOPIC METHODS IN THE INVESTIGATIONS OF MATERIALS**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Svetozar Musić received his Ph. D. degree in 1978., and M. sc. degree in 1972., both in Physical Chemistry at the Faculty of Science, University of Zagreb. He has been working at Ruđer Bošković Institute from 1970. From 1976. to 1977. he worked with Professor Attila Vértes at the Institute of Physical Chemistry and Radiochemistry, Eötvös-Loránd University, Budapest, Hungary, studying Mössbauer spectroscopy. In the period, 1980 - 1982 he was s guest scientist at Lehigh University, Bethlehem, Pennsylvania, USA. Among the many dueties at the Ruđer Bošković Institute he was a director of the research program "Science and Technology of Materials", and currently he is a principal researcher of the project "Synthesis and Microstructure of Metal Oxides and Oxide Glasses" and Head of Division of Materials Chemistry, Ruđer Bošković Institute. He contributes in teaching at the post-graduate level at the Faculty of Science and Faculty of Chemical Engineering and Technology, University of Zagreb.
Scientific interest: Investigation of metal oxides, oxide glasses and glass ceramics using different spectroscopic techniques. Up to date he has published about 200 scientific papers in Current Contents cited journals.

Date of last election

Referent publications of lecturer

1. M. Ristić, S. Popović, S. Musić, Formation and properties of $Cd(OH)_2$ and CdO particles, Mater. Lett. 58 (2004) 2494.
2. N. Šijaković-Vujičić, M. Gotić, S. Popović, Synthesis and microstructural properties of Fe-TiO_2 nanocrystalline particles obtained by a modified sol-gel method, J. Sol-Gel Sci. Technol. 30 (2004) 5.
3. M. Topić, S. Musić, M. Ristić, Study of relaxation in $Li_2Si_2O_5$ by thermally stimulated depolarization current, Mater. Chem. Phys. 76 (2002) 236.
4. M. Ristić, M. Ivanda, S. Popović, S. Musić, Dependence of nanocrystalline SnO_2 particle size on synthesis route, J. Non-Crystall. Solids 303(2002) 270.
5. S. Musić, M. Gotić, M. Ivanda, S. Popović, A. Turković, R. Trojko, A. Sekulić, K. Furić, Chemical and microstructural properties of TiO_2 synthesized by sol-gel procedure, Mater. Sci. Eng. B 47 (1997) 33.

Lecturer data	
Surname, Name	**PhD. Mirjana Metikoš-Huković, full professor**
E-mail adress	mmetik@fkit.hr
Course	**0.15. PRINCIPLES AND PREVENTION OF CORROSION**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Mirjana Metikoš-Huković is full professor of electrochemistry at the University of Zagreb, Faculty of chemical engineering. She received a PhD degree of Chemistry in 1975. with the thesis "Electrochemical study of the system valve metal - electrolyte", an MS degree in 1965. with the thesis " Impedance study of a passive iron electrode", both at the University of Zagreb, the Faculty of Technology, under the supervision of professor Branko Lovreček.

She worked three years as a visiting scientist at the Dechema Institute in Frankfurt/M, BRD, before taking up a faculty position in the Department of Electrochemistry at Faculty of Technology in 1971. Attended postdoctoral study at the Fritz Haber Institute in Berlin, BRD (1977.-1979.), and in 1993. was a visiting professor at the Institute of Energy Process Engineering Research Centre, Jülich, BRD.

Dr. Metikoš has published (authored or coauthored) of more than 100 reviewed research papers in top chemistry journals that were cited over 880 times, and has coauthored two chapters in books published by Marcel Decker.

Dr. Metikos is principal scientist of many domestic and international projects, and also has been a mentor on numerous graduation, master and doctoral thesis at her faculty, University of Split, University of Osijek.

The thrust of Dr. Metikoš's research has been the application of the solid-state and surface science to the fundamental aspects of passivity of metals and alloys, corrosion and inhibition protection, photoelectrochemistry and electrochemistry of semiconductors. Currend research involves study of surface properties of interfaces in regard to catalysis, fuel cells, hydrogen energy, involved "green" electrochemistry, electrochemical development of surface structure; self assembled monolayer of alkanethiols, metal nanoparticles.

Mirjana Metikoš-Huković is a member of many domestic and international societies, referee of distinguished journals in the field of electrochemistry, electrocatalysis and corrosion.

Date of last election

12.01.1999.

Referent publications of lecturer

1. M.Metikoš-Huković, Z. Grubač: The growth kinetics of thin anodic WO3 films investigated by electrochemical impedance spectroscopy. J. Electroanal. Chem., 556 (2003) 167-178.
2. M. Metikoš - Huković, E. Tkalčec, A. Kwokal, J. Piljac: An in vitro study of Ti and Ti-alloys coated with sol-gel derived hydroxyapatite coatings. Surface & Coatings Technology, 165 (2003) 40-50.
3. M. Metikoš - Huković, A. Kwokal, J. Piljac: The influence of niobium and vanadium on passivity of titanium-based implants in physiological solution. Biomaterials, 24 (2003) 3765-3775.
4. R. Babić, M. Metikoš - Huković, Z. Pilić. Passivity of mild steel in borate buffer solution containing tannin. Corrosion, 59 (2003) 890-896.
5. I. Milošev, H.-H. Strehblow, B. Navinšek, M. Metikoš - Huković: Electrochemical And Thermal-Oxidation of Tin Coatings Studied By XPS. Surface and Interface Analysis, 23 (1995) 529-539.

Lecturer data	
Surname, Name	**PhD. Saša Omanović, assistant professor**
E-mail adress	soman@fkit.hr
Course	**0.16. ELECTROCHEMISTRY FOR NEW TECHNOLOGIES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Saša Omanović was born in Bihać, Bosnia and Herzegovina in 1966. Bachelor degree in Chemical Engineering (1991), and Ph.D. degree in Chemistry (1995), Faculty of Chemical Engineering and Technology, University of Zagreb. From 2001 holds a position of Assistant Professor at McGill University, Montreal, Canada in the area of Chemical Engineering. Postdoctoral fellow at Acadia University, Wolfville, Canada from 1998 to 2000, and from 2000 to 2001 works as Assistant Director at Acadia Centre for Microstructural Analysis, Wolfville, Canada. In 2004 promoted to a level of 'docent' at the University of Zagreb. Major research areas: Electrocatalysis and bioelectrocatalysis for new environmentally friendly technologies and sustainable energy systems, Biosensors for medical applications, and electrochemistry of disease markers and biomolecules. Publications: 25 peer reviewed scientific papers in international journals cited in CC, and 55 international and national conference presentations. Affiliations: The Croatian Chemical Engineering Society, The Electrochemical Society – Canadian Executive Committee Member, The North American Catalysis Society, The Canadian Biomaterials Society.

Date of last election
05.05.2003.

Referent publications of lecturer

E. Navarro-Flores, Z.Chong, S.Omanovic. Characterization of Ni, NiMo, NiW and NiFe Electroactive Coatings as Electrocatalysts for the Hydrogen Evolution in an Acidic Medium, J. Molec. Catal. A: Chemical, 226 (2005) 179-197.

Azem, F. Man, S. Omanovic. Direct Regeneration of NADH on a Ru Modified Glassy Carbon Electrode. J. Mol. Catal. A: Chemical 219 (2004) 283.

S. Omanovic, S.G.Roscoe. The Effect of Linoleate on the Electrochemical Behaviour of Stainless Steel in Phosphate Buffer. Corrosion 56 (2000) 684.

S. Omanovic, S. G. Roscoe. Electrochemical Studies of the Adsorption Behaviour of Bovine Serum Albumin on Stainless Steel. Langmuir 15 (1999) 8315.

M. Metikos-Hukovic and S. Omanovic. Electrocatalytic Oxidation of Preadsorbed Monolayer of CO on Polycrystalline Pt_{60}-Ru_{40} Electrocatalyst: Nucleation and Growth of Oxygen-Containing Species, J. Mol. Catal. A:Chemical 136/1 (1998) 75.

Lecturer data	
Surname, Name	**PhD. Vera Kovačević, full professor**
E-mail adress	vkovac@fkit.hr
Course	**0.17. SURFACE ENGINEERING AND NANOSTRUCTURES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Vera Kovačević was born in Zagreb. B.Sc. Faculty of Technology, University of Zagreb, 1971; Ph.D. 1983 . From 1971- working at Faculty of Technology, from 1991. Faculty of Chemical Engineering and Technology, University of Zagreb. Professor from1992. Specializations at Universities of Bath and Loughborough, UK. Foreign languages: English and German. The main fields of research interests are surface engineering of polymer materials, composites and blends, nanocomposites, surface modifications. Published as author and co-author 98 papers; 57 scientific (37 CC cit.) and 41 profess. papers. Main researcher in 3 domestic and 2 foreign scientific projects. Mentor of several diploma, magisterial and Ph.D. works. Involved with several subjects in under- and postgraduate education processes.

Date of last election
16.09.1997

Referent publications of lecturer

1. V. Kovačević, M. Leskovac, S. Lučić, Morphology and Failure in Nanocomposites Part II: Surface Investigation, J. Adhes. Sci. Technol., 16, 2002, 1915-1929.
2. V. Kovačević, M. Leskovac, S. Lučić-Blagojević, D. Vrsaljko, Complex Adhesion Effects of Inorganic Nanofillers *vs* Microfillers in Polymer Composites, in Fillers for Formulations, J.M. Martin-Martinez (Ed.), Macromolecular Symposia 221, Wiley-VCH, 2005, p.11-23.
3. V. Kovačević, S. Lučić-Blagojević, M. Leskovac, Filler-Matrix Adhesion, Handbook of Adhesion, 2nd Edition, D.E. Packham, John Wiley & Sons, West Sussex, UK, 2005.
4. M. Leskovac, V. Kovačević, S. Lučić-Blagojević, D. Vrsaljko, V. Volovšek, Pretreatment of $CaCO_3$ Nanofiller by Irradiation Method in the Presence of Vinyl Monomers for PVAc Composites, e-Polymers, no.033 (2004), 1-13, http://www.e-polymers.org, ISSN 1618-7229
5. S. Lučić-Blagojević, V. Kovačević, M. Leskovac, D. Vrsaljko, V. Volovšek, Ch. Nover, Silane Pretreatment of Calcium Carbonate Nanofillers for PU Composites, e-Polymers, no. 036 (2004), 1-14, http://www.e-polymers.org, ISSN 1618-7229

Lecturer data	
Surname, Name	**PhD. Natalija Koprivanac, full professor**
E-mail adress	nkopri@fkit.hr
Course	**0.18. SYSTEMS OF ENVIRONMENTAL MANAGEMENT**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Natalija Koprivanac was born in Zagreb. Bachelor degree 1967, Faculty of Technology. Master of science degree 1974, Faculty of Natural Science. Ph.D. 1981, Faculty of Technology. From 2002 – full professor (permanent position), Faculty of Chemical Engineering and Technology Zagreb University of Zagreb. Publishing: 55 papers in scientific journals. Active participation in over 120 international and domestic conferences. Recently scientific interested has been focused to environmental engineering specially in the field of organic dyes and chlorinated hydrocarbons concerning to cleaner processes of organic chemical industry. Leadership of Scientific Projects: "Wastewater of organic dye manufacturing and apliccation",1992-1996; "Environmental Approach to Dyes and Pigments Production"" 1996-2002; ""Advanced Oxidation Processes for waste minimization of organic chemical industry, 2002-. From 2000, co-leader of Croatian-American project, "An International Collaboration on Electrical Discharge Reactors for Degradation of Organic Dyes". Other activities; 20 studies and projects for different chemical industries, also innovations and technological improvement in the field of organic dyes and pigments. From 1978-collaboration with University of Wales, Swansea, UK, ALIS foundation of British Council. 1999/2000 visiting professor at FAMU-FSU College of Engineering, Tallahassee, Florida, USA, Fulbright fellow. Certificates: 1997. Seminar for implementation of ISO 14001 "Introduction to Implementing ISO 14001 EMS", international certificate EARA, 1998. Certificate of Achievement of "Environmental Management Systems (EMS), international certificate, 1998. Professional Development Certificate (PDC) in Environmental Management and Cleaner Production in Industry, international certificate.

Date of last election
21.12.2000.

Referent publications of lecturer

1. N. Koprivanac, A. Lončarić Božić, S. Papić, Cleaner Production Processes in the Synthesis of Blue Anthraquinone Reactive Dyes, Dyes&Pigm. , 44 (2000) 33-40.
2. S. Papić, N. Koprivanac, A. Lončarić-Božić, Removal of Reactive Dyes from Wastewater using Fe(III) Coagulant, Journal of the Society of Dyers and Colourists, 116 (2000) 352-358.
3. S. Papić, N. Koprivanac, A. Meteš, Optimizing Polymer-Included Flocculation Process to Remove Reactive Dyes from Wastewater, Environmental Technology, 21 (2000) 97-105.
4. N. Koprivanac, A. Lončarić Božić, I. Peternel, D. Vujević, H. Kušić, Chlorinated Hydrocarbons Wastewater; Degradation Towards Minimization, Environmental Management; Different Approaches, «Environmental Management – Contribution to Solutions», s 1. Međunarodnog simpozija o upravljanju okolišem, Zagreb, 1. -3. listopada 2003. prihvaćeno za tisak, (2004)
5. D. Vujević, N. Koprivanac, A. Lončarić Božić, R. B. Locke, The Removal of Direct Orange 39 by Pulsed Corona Discharge from Model Wastewater, *Environmental Technology*. **25** (2004) 791.

Lecturer data	
Surname, Name	**PhD. Ivica Gusić, associate professor**
E-mail adress	igusic@fkit.hr
Course	**0.19. MATHEMATICAL METHODS IN ENGINEERING CHEMISTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ivica Gusić was born on October 8, 1954. in Grab (nearby Sinj). He received his B.Sc. in 1977, his M.A. in 1983 with thesis *The Enriques classification of two-dimenzional algebrai varieties,* and his Ph.D. in 1996 with thesis *A contribution to the arithmetic of elliptic curvesandi abelian varieties,* under the leadership of academician Marko Tadić (all from the University of Zagreb). He participates on The seminar for representation of Lie groups and on The seminar for number theory and algebra (and he is a coleader of it). He is interested in arithmetic of algebraic varieties, number theory, algebra, ordered structures, teaching of matematics, popularisation of mathematics and mathematics terminology.

Date of last election
23.09.2002.

Referent publications of lecturer

1. Ivica Gusić, Convex functions on lattice ordered groups, *Ann. Math. Silesianae* 11 (1997) 7-20.
2. Ivica Gusić, Note on certain inequality, *Journal of Math. Analysis and Appl*. 217 (1998) 687-692.
3. Ivica Gusić, A topology on lattice ordered groups, *Proc. of AMS* 126 (1998) 2593-2597.

Lecturer data

Surname, Name	**PhD. Želimir Kurtanjek, full professor**
E-mail adress	zkurt@pbf..hr
Course	**0.20. MATHEMATICAL MODELING**
Institution	Faculty of Food Technology and Biotechnology, Zagreb

Curriculum vitae

Želimir Kurtanjek in 1979 received Ph. D. degree in chemical engineering from University of Houston, TX, USA. His mentor was Prof. Dan Luss from the Laboratory for Reaction Engineering. He completed his postdoctoral studies with Prof. G. Froment at the Department of Chemical Engineering, University of Gent, Belgium. Presently he is employed at Faculty of Food Technology and Biotechnology, University of Zagreb as a professor of chemical engineering and is teaching reactor engineering, mathematical modelling and process control to students of biotechnology. In his scientific work he is interested in modelling and control of reactors, modelling of bioprocesses and food engineering, and application of AI methods in process control. He has published over 50 papers in international and national journals. He is editor of international journal Chemical and Biochemical Engineering Quarterly, and is a member of editorial board of international journal Food Technology and Biotechnology.

Date of last election
01.12.2004.

Referent publications of lecturer

1. Ž. Kurtanjek, “ Principal component analysis of bioreactor fed-batch operation by computer simulation”, Mathematics and Computers in Simulation, 44 (1997) 287-294.
2. J. Strohschein, Ž. Kurtanjek, “ Adaptive on-line optimisation of a chemical reactor system “, Chem. Biochem. Eng. Q., 11 (1997) 169-175.
3. Ž. Kurtanjek, " Principal Component Analysis of Integrated Chemical Plants ", Chem. Biochem. Eng. Q. 11 (1997) 25-29.
4. Ž. Kurtanjek, “ Structure of Principal Component Based Neural Network Models of Dynamic Systems “, Journal of Computing and Information Technology -CIT, 3 (1995) 1-8.
5. Ž. Kurtanjek, G. F. Froment, " Investigation of Surface Phenomena Associated With Oscillating Oxidation of CO on Pt", Chem. Eng. Sci., 41 (1991) 3189-3201.

Lecturer data	
Surname, Name	**PhD. Rajka Budin, full professor**
E-mail adress	rbudin@fkit.hr
Course	**1.1. ENERGY AND ENVIRONMENT LOAD**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Rajka Budin, born in Zagreb, holds a B. Sc. (1962.), M. D. (1970.) and Ph. D. (1974.) in chemical engineering from Faculty of Chemical Engineering and Technology, University of Zagreb. She works at the same Faculty, Department of thermodynamics and energy since 1962, as assistant, assistant professor and presently full professor. She teaches several courses on undergraduates and postgraduates courses In 1979/80 she joint the Department od Mechanical and Industrial Engineering at the University od Illinois Urbana-Champaign as an assistant professor Dr. Budin has published numerous articles in the areas of energy and power especially in energy savings strategies. The papers (117) are published in international (17) and domestic reviewed (13) journals, and international (57) and domestic (20) proceedings.
Dr. sc. Rajka Budin received the Fran Bošnjaković and Hrvoje Požar award for research on development of the energy management, as well as J. J. Strossmayer for book in the field of technical knowledges.
Kontakt: rbudin@fkit. hr, tel. 01/4597-138, fax 01/4597-260, FKIT, Savska 16, 10000 Zagreb.

Date of last election
16.09.1997.

Referent publications of lecturer

1. R. Budin, A. Mihelić-Bogdanić, V. Filipan. Energy conservation using recuperative drying process, Energy Convers. Mgmt 37 (1996) 1393-1399.
2. R. Budin, A. Mihelić-Bogdanić. Heat recovery in polyester production, Applied Thermal Engineering 17 (1997) 661-665.
3. R. Budin, A. Mihelić-Bogdanić, V. Filipan, The solarized evaporation processEnergy Convers. Mgmt 39 (l998) 1169-1175.
4. A. Mihelić-Bogdanić, R. Budin. Heat recovery in thermoplastic production, Energy Convers. Mgmt 43 (2002) 1079-1089.
5. R. Budin, A. Mihelić-Bogdanić, I. Sutlović, F. Briški. Smanjenje toplinskog i kemijskog opterećenja okoliša u procesu proizvodnje HDPE, Sigurnost 45 (2003) 1-11.

Lecturer data	
Surname, Name	**PhD. Felicita Briški, associate professor**
E-mail adress	fbriski@fkit.hr
Course	**1.2. BIOLOGICAL TREATMENT AND BIOREMEDIATION**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Felicita Briški graduated in 1975 at Faculty of Technology, Department of Biotechnology, University of Zagreb. From 1979 worked as microbiologist and after it as head of Department of Development and Technical-Technological Control in mineral water filling facility Badel-Jamnica. Master of science degree got in 1984, and in 1987 started to work as research assistant at Faculty of Chemical Engineering and Technology, Division of Industrial Ecology. PhD got in 1991 and from 1991-1995 had a position of research fellow. From 1995 is assistant professor. As author and co-author has published 20 scientific works in national and international journals and was participant at many national and international conferences. Speaks, reads and writes English, uses German and Hungarian

Date of last election
24.09.2001.

Referent publications of lecturer

1. H. Matanić, Z. Grabarić, F. Briški, N. Koprivanac, "Microbial decolorisation of chromium-azomethine dye under aerobic condition", J. Soc. Dyers Colourists, 112 (1996) 158-161.
2. F. Briški, L. Sipos, M. Petrović, Distribution of faecal indictor bacteria and nutrients in the Krka river in the region of the Krka National Park, Period Biol., 102 (2000) 273-281.
3. Ž. Filipović-Kovačević, L. Sipos, F. Briški, Biosorption of chromium, copper, nickel and zinc ions onto fungal pellets of Aspergillus niger 405 from aqueous solutions, Food Technol. Biotechnol., 38 (2000) 211-217.
4. L. Foglar, F. Briški, Wastewater denitrification process-the influence of methanol and kinetic analysis, Process Biochem., 39 (2003) 95-103.

Lecturer data	
Surname, Name	**PhD. Krešimir Košutić, assistant professor**
E-mail adress	kkosut@fkit.hr
Course	**1.3. PHYSICAL-CHEMICAL TREATMENT OF WATER**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Krešimir Košutić Education: B. Sc. 1990. , M. Sc. 1995. and Ph.D. 1999., University of Zagreb, Faculty of Chemical Engineering and Technology.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (2002.). Main research topics: pressure-driven membrane operations, preparing and characterisation of asymmetric membranes by phase inversion, characterisation of reverse osmosis and nanofiltration composite membranes, membrane applications for water treatment.
Current scientific project: Project: Development and investigation of complex methods of water treatment. Project EMCO: Reduction of environmental risks posed by emerging contaminants, through advanced treatmentof municipal and industrial wastes
Membership: Croatian Society of Chemical Engineers.

Date of last election
14.10.2002.

Referent publications of lecturer

1. K. Košutić, B. Kunst. Effect of hydrolysis on porosity of cellulose acetate reverse osmosis membranes. J. Appl. Poly. Sci., 81 (2001) 1768.
2. K. Košutić, B. Kunst. Removal of organics from aqueous solutions by commercial RO and NF membranes of characterized porosities. Desalination 142 (2002) 47.
3. K. Košutić, B. Kunst. RO and NF membranes fouling and cleaning and pore size distribution variations. Desalination 150 (2002) 113.
4. K. Košutić, I. Novak, L. Sipos, B. Kunst. Removal of Sulfates and Other Inorganics from Potable Water by Nanofiltration Membranes of Characterized Porosity Separation and Purification Technology 37 (2004) 177-185.
5. K. Košutić, LFurač, L. Sipos, B. Kunst, Removal of Arsenic and Pesticides from Drinking Water by Nanofiltration Membranes, Separ. Purif. Technol., 41 (2005) In Press Corrected proof

Lecturer data	
Surname, Name	**PhD. Štefica Cerjan- Stefanović, full professor**
E-mail adress	scerjan@fkit.hr
Course	**1.4. ION CHROMATOGRAPHY IN ENVIRONMENTAL ANALYSIS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Štefica Cerjan-Stefanović was born 19. September 1939. in Zagreb, Croatia.
B. C. E. : 19. April 1963, Faculty of Technology, University of Zagreb. Mentor: Ph. D. Aleksandar Bezjak, professor, "Determination of bemit structure". M. Sc. : 16. December 1968. Faculty of Technology, University of Zagreb. Mentor: Ph. D. Vjera Marjanović - Krajovan, professor, "Comparation of methods for determination of free CaO in clinkers". Ph. D. : 11. december 1973. Faculty of Technology, University of Zagreb, Mentor: Ph. D. Vjera Marjanović - Krajovan, professor, "Distribution of some chemical elements in iron materials".
Work experience: Since 1. December 1963. work at Laboratory for Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, as follows: assistant 1975.-1977.; Docent 1977.-1983.; professor since 1983. Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph. D. I. Incedya, professor.
Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia. Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ. Work experience: From 1. December 1963. until now work at Laboratory for Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, as follows: assistant 1975.-1977.; Docent 1977.-1983.; 1983. until now professor. Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph. D. I. Incedya, professor. Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia. Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ.

Date of last election
09.07.1990.

Referent publications of lecturer

1. Š. Cerjan-Stefanović, D. Grubiša, V. Šmid. Separation of Copper, Nickel, Tin and Lead on Ion Exchanger from Plating Rinsewater. Plating and Surface finishing 4 (1996) 74.
2. L. Ćurković, Š. Cerjan-Stefanović, T. Filipan. Metal Ion Exchange by Natural and Modified Zeolites, Wat. Res. 31 (1997) 1379.
3. S. Leaković, I. Mijatović, Š Cerjan-Stefanović, E. Hodžić. Nitrogen Remuval from Fertilizer Wastewater by Ion Exchange. Water Research A Journal of the International Water Association 34 (2000) 185.
4. Š. Cerjan-Stefanović, T. Bolanča, L. Ćurković. Selection of Criteria for Comparing and Evalueting the Optimization of Separation in Ion Chrmatography. Journal of Liquid Chromatography & Related Technologies 23 (2000) 2169.
5. G. Srečnik, Ž. Debeljak, Š. Cerjan - Stefanović, T. Bolanča, M. Novič, K. Lazarić, Ž. Gumhalter – Lulić. Use of Artificial Neural Networks for Retention Modelling in Ion Chromatography. Croatica Chemica Acta, 75 (2002) 713-725.

Lecturer data	
Surname, Name	**PhD. Marija Kaštelan-Macan, full professor**
E-mail adress	mmacan@fkit.hr
Course	**1.5. CHEMICAL WASTE WATER TREATMENT**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marija Kaštelan Macan was born at Dubrovnik, Croatia 23. V. 1939. Graduated 1957. from V. secondary school in Zagreb, diploma University of Zagreb, Faculty of Technology 1962. , Master's degree 1968. , PhD 1973. Thesis: "Theorethical considerations of thin-layer chromatographic process".
At Faculty of Technology (from 1991. Faculty of Chemical Engineering and Technology) assistant 1963. -75, assistant professor 1975. -82. , associated professor 1982. -88. , university professor from 1987. -, dean 1991. -93.
Subjects: Quality testing, Environmental analytical chemistry, Quality assurance (undergraduate studies); Chromatographic analysis of environment, Quality assurance of analytical system, Chemical wastewater treatment (graduated studies).
Research area: analytical chemistry, specially chromatography and enviromental protection.
Published 75 scientific conributions, about 50 professional and popularizing papers in journals and monographies and 6 books.

Date of last election
12.01.1999.

Referent publications of lecturer

1. M. Petrović, M. Kaštelan-Macan, A. J. M. Horvat. Interactive Sorption of Metal Ions and Humic Acids Onto Mineral Particles. Water Air Soil Pollut. 111 (1999) 41-56.
2. M. Petrović i M. Kaštelan-Macan, The uptake of phosphorus by insoluble metal-humic complexes. Wat. Sci. Technol. 34(7-8) (1996) 253-258.
3. Briški, M. Petrović, M. Kaštelan-Macan, L. Sipos, Removal of Humic Substances From Aqueous Solution by Fungal Pellets, Biocatalysis 10 (1994) 1-14.
4. M. Kaštelan-Macan, Š. Cerjan-Stefanović, D. Jalšovec. TLC Determination of Aquatic Humic Acids, Wat. Sci. Technol. 26 (1992) 2567.
5. M. Kaštelan-Macan, Š. Cerjan-Stefanović, M. Petrović, Phenol Adsorption of Active Carbon by Means of Thin Layer Chromatography. Chromatographia 27 (1989) 297.

Lecturer data

Surname, Name	**PhD. Zvonimir Šoljić, full professor**
E-mail adress	zsoljic@fkit.hr
Course	**1.6. LIQUID CHROMATOGRAPHY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Date of last election
09.11.1999.

Referent publications of lecturer

1. Z. Šoljić. Nature of chromatographic process for inorganic substances on cellulose and silicagel thin-layers, Chromatographia 11(3) (1979) 149.
2. Z. Šoljić. V. Grba, J. Bešić, Separation of some compounds from the 1, 4-benzodiazepine groupe by thin-layer chromatography, Chromatographia 10(12) (1977) 751.
3. Z. Šoljić. Ž. Hrestak, Sustavna kvalitativna analiza kationa tankoslojnom kromatografijom, Kem. Ind. 42(10) (1993) 359.
4. Z. Šoljić. S. Jurlina, Determination of platinum and rhodium in Pt-Rh catalysts vy TLC in situ, J. Liquid Chromatogr. & Rel. Technol. 19 (1996) 815.
5. Š. Šimunić, Z. Šoljić. Separation nad caracterisation by High performance thin-layer chromatography, J. Liquid Chromatogr. & Rel. Technol. 19 (1996) 1139.

Lecturer data

Surname, Name	**PhD. Zorana Grabarić, full professor**
E-mail adress	zgraba@fkit.hr
Course	**1.7. CHEMICAL SENSORS**
Institution	Faculty of Food Technology and Biotechnology, Zagreb

Curriculum vitae

Date of last election

Referent publications of lecturer

1. S. Diaz-Cruz, Z. Grabarić, B. S. Grabarić, M. Esteban and E. Casassas. "Optimisation of Resolution Function in Signals Ratio Method and Deconvolution by Polynomial Division-Quantitation of Cd(II) and In(II) from their Global Signals Obtained at Carbon Fibre Disk Ultramicroelectrode". *Anal. Chim. Acta* 382 (1999) 105-115.
2. S. Milardović, Z. Grabarić and B. S. Grabarić. "Sensitive Amperometric Oxalate Biosensor for Food Analysis". *Food Technol. Biotechnol.* 38 (2000) 203-210.
3. S. Milardović, Z. Grabarić, V. Rumenjak and M. Tkalčec. "Determination of Oxalate in Urine, Using an Amperometric Biosensor with Oxalate Oxidase Immobilized on the Surface of a Chromium Hexacyanoferrate-Modified Graphite Eectrode". *J. AOAC Intern.* 83 (2000) 1212-1217.
4. S. Milardović, Z. Grabarić, V. Rumenjak and M. Jukić. "Rapid Determination of Oxalate by an Amperometric Oxalate Oxidase-Based Electrode". *Electroanalysis* 12 (2000) 1051-1058.
5. S. Milardović, Z. Grabarić, V. Rumenjak, N. Blau and D. Milošević. "Use of Ruthenium(III), Iron(II) and Nickel(II) Hexacyanometallate-Modified Graphite Electrode with Immobilized Oxalate Oxidase for the Determination of Urinary Oxalate". *J. AOAC Intern.* 84 (2001) 1927-1933.

Lecturer data	
Surname, Name	**PhD. Ivana Murković Steinberg, assistant professor**
E-mail adress	imurkov@fkit.hr
Course	**1.8. BIOSENSORS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ivana Murkovic Steinberg graduated from the Faculty of Chemical Engineering & Technology (FKIT) at the University of Zagreb in 1990, and obtained a PhD from Karl-Franzens University, Graz, Austria in
1996 ("Absorbance and Fluorescence Based Optical Sensors for Determination of Heavy Metal Ions") under the supervision of Prof. O. S. Wolfbeis. From 1990 she was employed in the Department of General and Inorganic Chemistry at FKIT, where she was engaged in teaching undergraduate courses, and she became an Assistant Professor at the Department in 2003. International exchange visits have included a period spent at the Universitat Autonoma de Barcelona, Spain, under the EU programme
"Concerted Action: Chemical Sensors for In-Vivo Monitoring", and participation at two EU Biennial Intensive Training Workshop Eurocourses on Molecular Sensor Technology at the Institute of Biotechnology, University of Cambridge, UK. Scientific research interest is in design and development of novel optical sensors (fluorescence and absorbance based) and electrochemical sensors and biosensors for environmental and biomedical applications.

Date of last election
31.03.2003.

Referent publications of lecturer

1. I. Murkovic Steinberg, A. Lobnik, O. S. Wolfbeis: "Characterisation of an Optical Sensor Membrane Based on the Metal Ion Indicator Pyrocatechol Violet". Sensors and Actuators B, 90 (2003) 230-235.
2. I. Murkovic, M. D. Steinberg, B. Murkovic: "Sensors in Neonatal Monitoring: Current Practise and Future Trends". Technology and Health Care 11, (2003) 399-412.
3. I. Murkovic, A. Lobnik, G. J. Mohr, O. S. Wolfbeis: "Fluorescent Potential-Sensitive Dyes for Use in Solid-State Sensors for Potassium Ion" Analytica Chimica Acta, 334 (1996) 125.
4. I. Murkovic and O. S. Wolfbeis: "Fluorescence-Based Sensor Membrane for Mercury(II) Detection". Sensors and Actuators B, 38-39 (1997) 246.
5. A. Lobnik, I. Oehme, I. Murkovic and O. S. Wolfbeis: "pH Optical Sensors Based on Sol-gels: Chemical Doping versus Covalent Immobilization". Analytica Chimica Acta 367 (1998) 159.

Lecturer data	
Surname, Name	**PhD. Stjepan Milardović, assistant professor**
E-mail adress	smilard@fkit.hr
Course	**1.8. BIOSENSORS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Stjepan Miladović received B.S. and M.S. degrees in chemical technology from Faculty of Technology University of Zagreb, Croatia and the Ph.D. in chemistry from the Faculty of Chemical Engineering and Technology University of Zagreb, Croatia. He spent eight years at the photographic manufacture company and joined the Faculty of Chemical Engineering and Technology in 1990, where became the member of Professor B.S. Grabarić sensors group. He is currently Associate Professor at the Department of General and Inorganic Chemistry at the Faculty of Chemical Engineering and Technology University of Zagreb. His scientific interest include chemical sensors, biosensors, chemically modified electrodes and application of the electrochemical methods in the field of clinical chemistry.

Date of last election
06.11.2000.

Referent publications of lecturer

1. Milardovic S, Grabaric Z, Rumenjak V, et al: Rapid determination of oxalate by an amperometric oxalate oxidase-based electrode. Electroanal 12 (2000) 1051-1058.
2. Rumenjak V, Kruhak I, Milardovic S: A simple and inexpensive multichannel potentiometric blood analyzer for single and nonroutine measurements of electrolyte concentrations. Lab Robotics Automat 10 (1998) 205-213.
3. Milardovic S, Kruhak I, Ivekovic D, et al.: Glucose determination in blood samples using flow injection analysis and an amperometric biosensor based on glucose oxidase immobilized on hexacyanoferrate modified nickel electrode. Anal Chim Acta 350 (1997) 91-96.
4. Milardovic S, Miksaj M, Kruhak I, et al.: Preparation and characterization of simple amperometric biosensor for glucose with alkali nickel hexacyanoferrate(II) electrocrystallized on nickel electrode and glucose oxidase immobilized in bovine serum albumin cross-linked with glutaraldehyde. Food Technol Biotech 34 (1996) 153-159.

Lecturer data	
Surname, Name	**PhD. Sandra Babić, assistant professor**
E-mail adress	sbabic@fkit.hr
Course	**1.9. CHROMATOGRAPHIC METHODS IN ENVIRONMENTAL PROTECTION**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Sandra Babić graduated 1995. (B.Sc. Chem. Eng.) and 1998. (M.Sc. Chem.), 2003. received Ph.D. in Chemistry on Faculty of Chemical Engineering and Technology, University of Zagreb. Dissertation: Application of Genetic Algorithm in optimisation of chromatography system, advisor: M. Kaštelan-Macan, Ph.D., full professor. Since 2004. assistant professor at the Department of Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb. Published 1 chepter in book and 20 scintific papers. Participant in 3 local scintific projects. Since 2004. participant in european scientific project. Main interest is chromatography, optimization of chromatographic separation, application of chromatographic methods in protection of soil and water.

Date of last election
21.06.2004.

Referent publications of lecturer

1. S. Babić, D. Mutavdžić i M. Kaštelan-Macan. SPE Preconcentration and TLC Determination of Alachlor, Atrazine and alpha-Cypermethrin in Water Samples, JPC Journal of Planar Chromatography, Modern TLC 16 (2003) 160-164.
2. M. Petrović, S. Babić, M. Kaštelan-Macan. Quantitative Determination of Pesticides in Soil by Thin-layer Chromatography and Video Densitometry, Croat. Chem. Acta 73 (2000) 197-207.
3. M. Kaštelan-Macan, M. Petrović. S. Babić. Ultrasonic Extraction of Pesticides from Soil. J. Chromatogr. A 823 (1998) 3-9.
4. S. Babić, M. Kaštelan-Macan, M. Petrović, Determination of Agrochemical Combinations in Spiked Soil Samples. Wat. Sci. Technol. 37 (8) (1998) 243-250.
5. M. Petrović, M. Kaštelan-Macan, S. Andrašić (Babić). Application of a Colour Analyzer in Quatitive Thin-Layer Chromatography. J. Chroatogr. A 771 (1997) 251-257.

Lecturer data	
Surname, Name	**PhD. Alka Horvat, assistant professor**
E-mail adress	ahorvat@fkit.hr
Course	**1.10. MODERN METHODS FOR SAMPLE PREPARATION IN CHROMATOGRAPHY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Born in Zagreb 1946. School attended in Zagreb and Varaždin. Gymnasium (High school) exam 1965
Gymnasium Varaždin. Graduated (1970) and Master degree (1981) at Faculty of Technology, University of Zagreb. Dissertation - Study and Characterisation of Silicon Complex Speciation in Aqueous Solutions - 1998 Faculty of Chemical Engineering and Technology, University of Zagreb. Assistant professor.
Resarch stay: Institut fur Analytische Chemie und Radiochemie, Universität des Saarlandes, Saarbrücken, Germany, DAAD schoolarship.
Research area: Analytical chemistry, spectrometric and chromatographic methods.
Publications: About 25 published papers, participant at about 40 symposia and conferences. Active participant at eight projects (one finaced by EU (FP6-INCO).

Date of last election
14.10.2002.

Referent publications of lecturer

1. Horvat, Alka J. M. ; Kaštelan-Macan, Marija; Petrović, Mira; Barbarić, Željka. Study of MCPA and MCPP Herbicides Mobility in Soils from North-West Croatia as Affected by Presence of Fertilizers Journal of Environmental Science and Health, Part B-Pesticides, Food Contaminants and Agricultural Wastes. 38 (2003) 305-316.
2. Horvat, Alka J. M. ; Šoljić, Zvonimir; Debelić, Mirela. Qualitative Identification of Metal Ions in Honey by Two-Dimensional Thin-Layer Chromatography Journal of Planar Chromatography - Modern TLC. 15 (2002) 367-370.
3. Horvat, Alka J. M. ; Živko-Babić, Jasenka; Ivanković, Danijela; Babić, Sandra; Kaštelan-Macan, Marija. Anodic Sampling and TLC Identification of Dental Alloys. Journal of Planar Chromatography - Modern TLC. 14 (2001) 426-429.
4. Petrović, Mira; Kaštelan-Macan, Marija; Horvat, Alka J. M. Interactive sorption of metal ions and humic acids onto mineral particles. Water, Air, and Soil Pollution. 111 (1999) 41-56.
5. Horvat, Alka J. M. ; Mažuranić, Karmen. Spectrophotometric Determination of Total Arsenic in Gelatine. Acta Pharmaceutica Jugoslavica. 40 (1990) 507-511.

Lecturer data	
Surname, Name	**PhD. Sanja Papić, assistant professor**
E-mail adress	spapic@fkit.hr
Course	**1.11. POLLUTION PREVENTION FOR CHEMICAL PROCESSES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Sanja Papić was graduated in 1983. , M. Sc. in 1989. and Ph. D in Chemical Engineering in 1997. at Faculty of Chemical Engineering and Technology, University of Zagreb. Working at the same Faculty on the Department of Polimer Engineering and Organic Chemical Technology as a assistant since 1984. , assistant professor since 2001. Published 15 scientific works in journals CC cited, 14 in conference proceedings, 2 chapters in books. Worked as a collaborator at 5 national and 1 international scientific projects. Research areas are organic industrial processes, synthesis and characterization of dyes, clenaer production processes in the synthesis of dyes, environmental engineering, study of organic industry wastewater treatment processes including advanced technologies for water purification.

Date of last election
29.01.2001.

Referent publications of lecturer

1. S. Papić, N. Koprivanac, A: Meteš. Optimizing Polymer-Induced Flocculation Process to Remove Reactive Dyes from Wastewater. Environmental Technology 21 (2000) 97-105.
2. N. Koprivanac, A. Lončarić Božić, S. Papić, Cleaner Production Processes in the Synthesis of Blue Anthraquinone Reactive Dyes, Dyes and Pigments 44 (2000) 33-40.
3. S. Papić, N. Koprivanac, A. Lončarić Božić. Removal of Reactive Dyes from Wastewater Using Fe(III) Coagulant. JSDC 116 (2000) 352-358.
4. S. Papić, N. Koprivanac, A. Lončarić Božić, A. Meteš. Removal of Some Reactive Dyes from Synthetic Wastewater by Combined Al(III) Coagulation/Carbon Adsorption Process. Dyes and Pigments 62 (2004) 293-300.
5. N. Koprivanac, Z. Lazarević, A. Lončarić Božić, S. Papić, J. Balenović. TLC with densitometry in wasteminimization. 22th International Symposyum on Chromatography, Roma, 1998, 453.

Lecturer data	
Surname, Name	**PhD. Vladimira Vađić, full professor**
E-mail adress	vadic@imi.hr
Course	**1.12. CONTROL OF AIR QUALITY**
Institution	IMI, Zagreb

Curriculum vitae

Vladimira Vađić was born on 12 December 1944 in Zagreb, Croatia. She graduated from the Faculty of Technology, University of Zagreb in 1968 and has been working within the Environmental Hygiene Unit of the Institute for Medical Research and Occupational Health, Zagreb ever since, and has been the head of the Unit since1991.
In 1977, Dr. Vađić took her master's degree and in 1984 a doctoral degree from the Faculty of Technology, University of Zagreb. In 1985 she became a research associate, in 1990 a senior research associate, and in 1992 a scientific adviser, only to confirm the latter title in 1998. Vladimira Vađić has published 105 scientific and 15 professional papers in Croatian and foreign journals. She participated in or headed several Croatian and international scientific projects. Since 1991, she has been chosen to co-ordinate the cooperation between WHO and UNEP GEMS/AIR (Global Environmental Monitoring System) and Croatia. Since 1996, this duty has been extended to the COST-615 CITAIR project "Database, Monitoring and Modelling of Urban Air Pollution". Dr. Vađić chairs the Croatian Air Pollution Prevention Association and acts as its co-ordinator on the international level. She is the member of the International Committee within the International Union of Air Pollution Prevention Associations and of the Executive Committee of the European Federation of Clean Air. She is the member of a committee of technical advisers, and the chair of a subcommittee for outer atmosphere within the national standardisation agency Državni zavod za normizaciju i mjeriteljstvo.

Date of last election

Referent publications of lecturer

1. Vađić, V., Hršak, J., Kalinić, N., Čačković, M. and Šega, K.: Seasonal Differences in the Levels of Gaseous Air Pollutants in the Vicinity of a Waste Dump. Environmental Monitoring and Assessment 65 (2000) 147-153.
2. Čačković, M., Šega, K., Vađić, V., Bešlić, I., Šoljić, Z.: Seasonal Distributions of Acid Components in PM2. 5 Fraction of Airborne Particles in Zagreb Air. Bull Environ Contam Toxicol 67 (2001) 704-711.
3. Šišović, A., Škrbec, A., Vadjić, V., Kalinić, N. And Hršak, J.: PAH Levels and Profiles in the Suspended Particulate Matter in Zagreb Through Four Seasons. Environmental Monitoring and Assessment 74 (2002) 217-224.
4. Pehnec, G., Vadjić, V., Hršak, J.: Comparison of Active and Passive Measurement of Ozone in Zagreb Air. Bull. Environ. Contam. Toxicol. 70 (2003) 343-350.
5. Vađić, V.: Air quality in Croatia, monitoring and categorization at regional scale. U: Šega, K, urednik. Proceedings of the 14th International Conference "Air Quality - Assessment and Policy at Local, Regional and Global Scales"; 6. -10. 2003. ; Dubrovnik. Zagreb: CAPPA - Croatian Air Pollution Prevention Association, 2003, str. 783-92.

Lecturer data	
Surname, Name	**PhD. Božena Ćosović, senior scientist**
E-mail adress	cosovic@irb.hr
Course	**1.13. VOLTAMMETRIC METHODS OF ANALYSIS OF METALS AND ORGANIC MATTER IN THE ENVIRONMENT**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Božena Ćosović was graduated at the Faculty of Technology, University of Zagreb in 1963. MSc degree obtained in 1965 at the Faculty of Sciences, University of Zagreb, as well as the PhD degree in 1967. Employed at the Ruđer Bošković Institute since 1963. Senior scientist in the Center for Marine and Environmental Research since 1989. Head of the Center 1991-2003. Director of the long-term research programme «Environmental Risk Studies in the Adriatic and Continental Regions of Croatia». Published over 100 scientific papers in CC journals, many technical reports, professional publications and studies. Field of research: aquatic chemistry, fundamental and applied electrochemistry, development of new methods and techniques in marine and environmental research, characterization of organic matter in natural waters and adsorption processes at model and natural phase boundaries.
Member of several Croatian and international professional societies. Since 1992 member of the European Environmental Research Organization (ESF-EERO); since 1996 member of the EERO Council. Courses in the postgraduate studies in Chemistry and Oceanology, at the University of Zagreb and in the interdisciplinary postgraduate study « Nature Conservation and Environment Protection» at the University of Osijek, Croatia
E-mail cosovic@irb. hr

Date of last election

Referent publications of lecturer

1. B. Gašparović, D. Risović, B. Ćosović. Complex voltammetric and fractal study of adsorbed layers strucure of pure Triton-X-100 and in mixture with o- or p-nitrophenol. Electrochim. Acta, 49 (2004) 3383-3396.
2. D. Krznarić, I. Ciglenečki, B. Ćosović. Voltammetric investigations of 2- dimethylarsinyl ethanol sulphide in NaCl and seawater. Anal. Chim. Acta 431 (2001) 269.
3. B. Ćosović, V. Vojvodić. Voltammetric analysis of surface active substances in natural seawater. Electroanalysis 10 (1998) 429.
4. I. Ciglenečki, B. Ćosović. Electrochemical determination of thiosulfate in seawater in the presence of elemental sulfur and sulfide. Electroanalysis 9 (1997) 775.
5. M. Plavšić, B. Ćosović. Influence of surface active substances on the oxidoreduction processes of metal ions- A contribution to the speciation of metals in aqueous systems. Anal. Chim. Acta 284 (1994) 539.

Lecturer data	
Surname, Name	**PhD. Natalija Koprivanac, full professor**
E-mail adress	nkopri@fkit.hr
Course	**1.14. WASTE MANAGEMENT OF CHEMICAL INDUSTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Natalija Koprivanac was born in Zagreb. Bachelor degree 1967, Faculty of Technology. Master of science degree 1974, Faculty of Natural Science. Ph. D. 1981, Faculty of Technology. From 2002 – full professor (permanent position), Faculty of Chemical Engineering and Technology Zagreb University of Zagreb. Publishing: 55 papers in scientific journals. Active participation in over 120 international and domestic conferences. Recently scientific interested has been focused to environmental engineering specially in the field of organic dyes and chlorinated hydrocarbons concerning to cleaner processes of organic chemical industry. Leadership of Scientific Projects: "Wastewater of organic dye manufacturing and apliccation", 1992-1996; "Environmental Approach to Dyes and Pigments Production"" 1996-2002; ""Advanced Oxidation Processes for waste minimization of organic chemical industry, 2002-. From 2000, co-leader of Croatian-American project, "An International Collaboration on Electrical Discharge Reactors for Degradation of Organic Dyes". Other activities; 20 studies and projects for different chemical industries, also innovations and technological improvement in the field of organic dyes and pigments. From 1978-collaboration with University of Wales, Swansea, UK, ALIS foundation of British Council. 1999/2000 visiting professor at FAMU-FSU College of Engineering, Tallahassee, Florida, USA, Fulbright fellow. Certificates: 1997. Seminar for implementation of ISO 14001 "Introduction to Implementing ISO 14001 EMS", international certificate EARA, 1998. Certificate of Achievement of "Environmental Management Systems (EMS), international certificate, 1998. Professional Development Certificate (PDC) in Environmental Management and Cleaner Production in Industry, international certificate.

Date of last election
12.12.2000.

Referent publications of lecturer

1. N. Koprivanac, A. Lončarić Božić, S. Papić, Cleaner Production Processes in the Synthesis of Blue Anthraquinone Reactive Dyes, Dyes&Pigm., 44 (2000) 33-40.
2. S. Papić, N. Koprivanac, A. Lončarić-Božić, Removal of Reactive Dyes from Wastewater using Fe(III) Coagulant, Journal of the Society of Dyers and Colourists, 116 (2000) 352-358.
3. S. Papić, N. Koprivanac, A. Meteš, Optimizing Polymer-Included Flocculation Process to Remove Reactive Dyes from Wastewater, Environmental Technology, 21 (2000) 97-105,.
4. N. Koprivanac, A. Lončarić Božić, I. Peternel, D. Vujević, H. Kušić, Chlorinated Hydrocarbons Wastewater; Degradation Towards Minimization, Environmental Management; Different Approaches, «Environmental Management – Contribution to Solutions», s 1. Međunarodnog simpozija o upravljanju okolišem, Zagreb, 1. -3. listopada 2003., (2004).
5. D. Vujević, N. Koprivanac, A. Lončarić Božić, R. B. Locke, The Removal of Direct Orange 39 by Pulsed Corona Discharge from model Wastewater, *Environmental Technology*. 25 (2004) 791-800.

Lecturer data	
Surname, Name	**PhD. Franjo Plavšić, full professor**
E-mail adress	plavsic@hzt.hr
Course	**1.15. PROVIDING OF CHEMICALS AND PREVENTING ACCIDENTS**
Institution	Croatian National Institute of Toxicology, Zagreb

Curriculum vitae

Born in 1946, graduated in 1970 on the Faculty of Chemical Engineering in Zagreb, acquired Master of Science degree in 1992 and PhD degree in 1982. Appointed assistant professor in 1983, associate professor in toxicology in 1986, and full professor of toxicology in 1990 at the School of Pharmacy, University of Zagreb. Actually professor of Toxicology and Clinical Pharmacokinetics on School of Pharmacy, School of Medicine, Faculty of Science and School of Veterinary Medicine, University of Zagreb.
Head in Centre of Biomedical Research, University Hospital Centre Zagreb from 1993 to 1998. Director in Croatian National Institute of Toxicology from 1998.
Author of more than 130 scientific papers, editor of 7 books for students, author of 15 chapters in books of other editors, author of more than 200 reports or posters on congresses, etc.
Appointed leader of Croatian Postgraduate Specialisation Course in Analytical Toxicology from 1992, member of Croatian Doping Commission from 1992 to 1999, member of Parliament Commission for Dangerous Waste Disposition from 1992 to 1995, member of Croatian Interuniversity Commission for the Confirmation of the Scientific and University Functions in Biomedicine from 1993 to 1999, Croatian State Counsellor in ecotoxicology and in protection against chemical accidents from 1995, member of State Headquarters for chemical accidents from 1999, member of State Commission for Monitoring of environment, member of State Commission for poisons, member of scientific boards or advisory editorial board in many Croatian scientific journals, etc.

Date of last election

Referent publications of lecturer

1. Plavšić F., Stavljenić A., Vrhovac B., Osnove kliničke farmakokinetike. Školska Knjiga, Zagreb 1992.
2. Plavšić F., Wolf-Čoporda A., Lovrić Z., Capak K., Osnove toksikologije. O-tisak, Zagreb 2001.
3. Duraković i sur., Klinička toksikologija. Grafos, Zagreb 2000.
4. Plavšić F., Lovrić Z., Wolf-Čoporda A., Neke zakonske obveze osoba koje rade s otrovima. O-tisak, Zagreb, 2003.
5. Plavšić F., Interventni planovi. spremno za tisak.

Lecturer data	
Surname, Name	**PhD. Grace Karminski-Zamola, full professor**
E-mail adress	gzamola@fkit.hr
Course	**2.1. CHEMISTRY OF NONNUCLEOSIDE ANTINEOPLASTICS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Grace Karminski-Zamola was born in Zagreb, 1940. Completed secondary schooling in Zagreb 1958. Graduated on the Faculty of Technology in Zagreb 1962. Win a master's degree on the Faculty of Natural Sciences and Mathematics in Zagreb 1969. Got her's doctor's degree on the Faculty of Technology in Zagreb 1972 on the field of Organic Chemistry. Appointed as university assistant 1962. Promoted into the assistant professor 1975, into associate professor in 1986, into full professor 1996 and permanent full professor into 2000 year. She is teaching Organic Chemistry, Design of Organic Organic Chemical Synthesis, Synthetic Drugs on the graduate study on the Faculty of Chemical Engineering and Technology in Zagreb and Heterocycles in biomolecules and Industry, Chemistry of Nonnucleoside Antineoplastics on the postgraduate study on Faculty of Chemical Engineering and Technology in Zagreb and Organic Photochemistry on the Faculty of Natural Sciences and Mathematics in Zagreb.

Under the mentorship of the prof. G. Karminski-Zamola is made more than sixty diploma thesis, more master of science and doctor's thesis.

Scientific work includes the field of synthetic organic chemistry, synthetic photochemistry: synthesis and photochemical synthesis of heterocyclic compounds from furan, thiophene, benzimidazole, benzthiazole, quinolone series and their derivatives like carboxylic acids, amides, amidines and bis amidines, chemistry of dibenzosuberones and microcyclic antibiotics. She is studing antiinfective and antitumor activity of heterocyclic compounds as well as the mechanism of action.

She is the author of more than sixty scientific papers, from which 54 are cited in Current Contents a few professional papers and a few patents. She is the coordinator of more national and international scientific projects.

Date of last election

01.02.2000.

Referent publications of lecturer

1. I. Ćaleta, M. Grdiša, D. Mrvoš-Sermek, M. Cetina, V. Tralić-Kulenović, K. Pavelić, G. Karminski-Zamola. Synthesis, crystal structure and antiproliferative evaluation of some new substituted benzothiazoles and styrylbenzothiazoles. Il Farmaco. 59 (2004) 297-305.
2. J. Dogan Koruznjak, M. Grdisa, N. Slade; B. Zamola, K. Pavelić, G. Karminski-Zamola. Novel Derivatives of Benzo[b]thieno[2, 3]quinolones: Synthesis, Photochemical Synthesis and Antitumor Evaluation. J. Med. Chem. 46 (2003) 4516-4524.
3. M. Hranjec, M. Grdiša, K. Pavelić, W.D. Boykin, G. Karminski-Zamola. Synthesis and antitumor evaluation of some new substituted amidino-benzimidazolyl- furyl-phenyl-acrylates and naphtho[2, 1-b]furan-carboxylates. // Farmaco. 58 (2003) 1319-1324.
4. J. Dogan Koruznjak, N. Slade, B. Zamola, K. Pavelic, G. Karminski- Zamola. Synthesis, photochemical synthesis and antitumor evaluation of novel derivatives of thieno[3', 2':4, 5]thieno[2, 3-c]quinolones. Chemical and Pharmaceutical Bulletin. 50 (2002) 656-660.
5. M. Hranjec, K. Starčević, B. Zamola, S. Mutak, M. Đerek, G. Karminski- Zamola. New Amidino-benzimidazolyl Derivatives of Tylosin and Desmycosin. Journal of Antibiotics. 55 (2002) 308-314.

Lecturer data	
Surname, Name	**PhD.Marija Šindler, full professor**
E-mail adress	msindler@fkit.hr
Course	**2.2. ORGANIC CHEMISTRY INTEGRAL APPROACH**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marija Šindler (born Kulyk) - Bachelor: 1964. Faculty of Technology, University of Zagreb, Croatia Master: 1970. Faculty of Natural Sciences and Mathematics, University of Zagreb, and Ph. D.: 1976. Faculty of Science in Nijmegen (Netherlands).
Education and specialisation: 1973 – 1976. Ph.D. study at Katholieke Universiteit Nijmegen (Nijmegen, Netherlands), photochemistry of vinylstylbenes. 1979 – 1982. Postdoctoral fellow at Bowling Green State University (Ohio, USA), organic photochemistry of heterocycles (with Prof. Dr D. C. Neckers on the project: Photochemistry of benzothiazoles and benzisothiazoles in the presence of alkenes and alkynes - Photochemical intermolecular cycloadditions). 23.9. -29.9.1991. One-week collaboration at Universite Catholique de Louvain in Louvain-La-Neuve (Belgium) financed from EC as TEMPUS program Action 2 Individual Mobility Grants.
Employment: Since 1965. at the Faculty of Chemical Engineering and Technology (former Faculty of Technology), Department of Organic Chemistry, Marulićev trg 20, 10000 Zagreb, and full professor is since 01.02.2000.
Research interest: Synthesis and photochemistry of selected cyclic and heterocyclic unsaturated systems with particular emphases on the study of intra- and intermolecular cycloaddition reactions and rearrangement reactions in ground and excited states; synthesis of the potentially biologically active compounds; synthesis of new heterocyclic modifications of macrolide antibiotics.
Memberships: EPA (European Photochemistry Association), ISHC (International Society of Heterocyclic Chemistry), HKD (Croatian Chemical Society), HDKIT (Croatian Society of Chemical Engineers);
Member of the Editorial board of Croatica Chemica Acta (CCA, since 1994-)

Date of last election

01.02.2000.

Referent publications of lecturer

1. N. Basarić, Ž. Marinić, M. Šindler-Kulyk: "Photochemical Formation of Novel Pyrrolo[3,2-b]-6,7-benzobicyclo[3.2.1]octa-2,6-diene", J. Org. Chem. 68 (2003) 7524-7527.
2. N. Basarić, Ž. Marinić, M. Šindler-Kulyk, "Photochemistry of stilbenyl-pyrroles: A new approach to indole and isoindole derivatives", Tet. Letters 44 (2003) 7337-7340.
3. Škorić, Ž. Marinić, M. Šindler-Kulyk, "Synthesis and Photochemistry of Styryl Substituted Annelated Furan Derivatives. IV. Concentration Directing Intra- and/or Intermolecular [2+2] Cycloaddition", Croatica Chem. Acta 77 (2004) 161-166.
4. K. Butković, Ž. Marinić, M. Šindler-Kulyk, "Complete ^{1}H and ^{13}C NMR assignment of cis- and trans-3-{2-[2-(4-methylphenyl)ethenyl]phenyl}sydnones", Magnetic Resonance in Chemistry 42 (2004) 1053-1055.
5. K. Butković, N. Basarić, K. Lovreković, Ž. Marinić, A. Višnjevac, B. Kojić-Prodić, M. Šindler-Kulyk, "Photochemistry of □-(4-sydnonyl)-o-divinylbenzene: Competitive cis-trans isomerization and photolysis", Tet. Letters 45 (2004) 9057-9060.

Lecturer data	
Surname, Name	**PhD. Predrag Novak, full professor**
E-mail adress	predrag.novak@pliva.hr
Course	**2.3. PRINCIPLES AND APPLICATION OF NMR SPECTROSCOPY**
Institution	Pliva, Zagreb

Curriculum vitae

Predrag Novak received B. S. degree in Chemistry from the Faculty of Natural Science, University of Zagreb in 1990. He completed his Ph. D. degree in 1995 at the Rudjer Boskovic Institute where he stayed until 1998. In this period he worked in the area of NMR spectroscopy and visited for a longer or shorter time academic institutions abroad (Austria, Germany, Hungary, Slovenia) as research fellow. In 1998 he joined Research institute at PLIVA where he established laboratory for NMR and laboratory for spectroscopy. He was project manager of structure based drug design. As a result of his scientific work he was awarded Egon Matijevic prize in 1999 from the Croatian Chemical Society.
His current research interest involve the use of NMR and molecular modeling in conformational analysis and drug design, hydrogen bonding interactions, isotope effects in NMR spectra and the development and application of hyphenated LC-NMR and LC-MS techniques in mixture analysis. He published forty papers and a review article in a book. He gave fifteen invited lectures at conferences and scientific institutions.

Date of last election

Referent publications of lecturer

1. P. Novak, D. Vikić-Topić, E. Gacs-Baitz i Z. Meić, "Influence of a Side-Chain on Deuterium Isotope Effects in ^{13}C NMR Spectra of Some Benzene Derivatives", Magn. Reson. Chem. 34 (1996) 610-615.
2. P. Novak, S. Sekušak, D. Vikić-Topić and Z. Popović: Hydrogen Bonding Interactions in the 2,2'-Bipyridine-Pyromelitic Acid Complex. Infrared, Nuclear Magnetic Resonance and Theoretical Studies, J. Chem. Soc., Faraday Trans., 94 (1998) 1051-1056.
3. I. Jerić, P. Novak, M. Vinković i Š. Horvat, "Conformational Analysis of Sugar-Peptide Adducts in Solution State by NMR Spectroscopy and Molecular Modelling", J. Chem. Soc. Perkin Trans. 2, 10 (2001) 1944 - 1950.
4. M. Cindrić, V. Vrdoljak, N. Strukan, P. Tepeš, P. Novak, A. Brbot-Šaranović, B. Kamenar, i G. Giester, "New dinuclear molybdenum(V) complexes with β'-hydroxy-β-enaminones containing 4-hydroxy-2-pyrone ring". Eur. J. Inorg. Chem. 2002 (2002) 2128-2137.
5. P. Novak, P. Tepeš, M. Cindrić, M. Ilijaš, S. Dragojević, K. Mihaljević "Combined use of liquid chromatography-nuclear magnetic resonance spectroscopy and liquid chromatography-mass spectrometry for the characterisation of an acarbose degradation product", J. Chromatogr. A, 1033 (2004), 299-303.
6. P. Novak, Z. BanićTomišić, P. Tepeš, J. Plavec, G. Lazarevski, i G. Burek, "Conformational Analysis of Oleandomycin and its 8-methylene-9-oxime Derivative by NMR and Molecular Modeling Methods", Org. Biomol. Chem., 3 (2005) 39 – 47.

Lecturer data

Surname, Name	**PhD. Ljerka Duić, full professor**
E-mail adress	lduic@fkit.hr
Course	**2.4. PROCESSES OF ELECTROORGANIC SYNTHESIS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ljerka Duić graduated from the Faculty of Technology, University of Zagreb in 1960, and received Ph.D. degree in chemistry in 1964, also from the Faculty of Technology, University of Zagreb. Since 1988 she is full professor. She has published ca 100 scientific publications, 22 cited in tertiary scientific journals, participated in international scientific meetings with ca 20 presentations, and in domestic meetings with 40 presentations. She was a Chief researcher in 6 scientific projects and participated in a research in 5 scientific projects in the USA, and in 3 domestic scientific projects. She is also the author of 3 reviewed student textbooks published by "Liber". The area of scientific research: the investigation of electrochemical processes, especially in organic electrochemistry. Recently, in some ten years she carries out an intensive research in the electrochemistry of conductive polymers, their electrochemical synthesis and their applications in catalysis and in corrosion protection. She was a postdoctoral fellow at the University of Pennsylvania, Philadelphia, USA (1965-67), an invited scientist at State University of New York, NY. USA (1969-1971), and a visiting scientist at the University of Ottawa, Canada (1979-80).

Date of last election
12.01.1999.

Referent publications of lecturer

1. Lj. Duić, Osnove organske elektrokemijske sinteze, "Liber" Zagreb, 1984.
2. Z. Vajtner, M. Lukić i Lj. Duić. Preparativne elektrokatalitičke redukcije na olovnoj elektrodi XI jugoslavenski simpozij o elektrokemiji (1989), Knjiga radova.
3. A. Davidović, I. Tabaković, Dj. Davidović, Lj. Duić. Electrochemical Reduction of p-nitrozodiphenylamine in a cationic micellar system, J. Electroanal. Chem. , 280 (1990) 371.
4. Lj. Duić, Z. Mandić. Counter-ion and pH effect on the electrochemical synthesis of polyaniline, J. Electroanal. Chem. , 335 (1992) 207.
5. Lj. Duić, S. Kovač, Z. Mandić. Polymer-dimer distribution in the electrochemical synthesis of polyaniline, Electrochim. Acta, 40 (1995) 1681.

Lecturer data	
Surname, Name	**PhD. Mladen Mintas, full professor**
E-mail adress	mmintas@fkit.hr
Course	**2.5. DESIGN AND BIOLOGICAL MECHANISM OF ACTION OF ORGANIC SYNTHETIC DRUGS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Mladen Mintas, was born on August 22. 1943. in Varaždin, Croatia. Since 1993 is full professor (permanent position) of Chemistry at the Laboratory of Organic Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia. Education: B. Sc. Degree, Technological Faculty, University of Zagreb (1968); M. Sc. Degree (Faculty of Pharmacy and Biochemistry, University of Zagreb, 1972) and Ph. D. Degree at the University of Zagreb in 1976. Postdoctoral specialization: University of Regensburg, Germany (1977-1979) and Nuclear Research Center Karlsruhe, Germany (1979-1980). Visiting professorship: New York University, New York, N. Y. , USA, 1987-1988 and ETH Zürich, Department Pharmazie, 1999-2000. He has published 70 scientific papers (CC, SCI) and two university text books on drugs. Research field: Development of new pharmacologically active compounds, particularly the leading compounds with antiviral and cytostatic activities. He has been involved for many years in international collaborative research projects.

Date of last election
10.11.1998.

Referent publications of lecturer

1. S. Raić-Malić, A. Hergold-Brundić, A. Nagl, M. Grdiša, K. Pavelić, E. De Clercq and M. Mintas: "Novel Pyrimidine and Purine Derivatives of L-Ascorbic Acid: Synthesis and Biological Evaluation", J. Med. Chem. 42 (1999) 2673-2678.
2. S. Raić-Malić, D. Svedružić, T. Gazivoda, A. Hergold-Brundić, A. Nagl, J. Balzarini, E. De Clercq and M. Mintas: "Synthesis and Biological Activities of Novel Pyrimidine Derivatives of 4, 5-Didehydro-5, 6-dideoxy-L-Ascorbic Acid", J. Med. Chem. 43 (2000) 4806-4811.
3. P. Pospisil, B. D. Pilger, P. Schelling, C. Wurth, L. Scapozza, G. Folkers, M. Pongracic, M. Mintas and S. Raić-Malić: Synthesis, Kinetics and Molecular Docking of Novel 9-Hydroxypropyl Purine Nucleoside Analogues as Ligands of Herpesviral Thymidine Kinases. Helv. Chim. Acta, 85 (2002) 3237-3250.
4. S. Prekupec, D. Svedružić, T. Gazivoda, D. Mrvoš-Sermek, A. Nagl, M. Grdiša, K. Pavelić, J. Balzarini, E. De Clercq, G. Folkers, L. Scapozza, M. Mintas and S. Raić-Malić. Synthesis and Biological Evaluation of Iodinated and Fluorinated 9-(2-Hydroxypropyl) and 9-(2-Hydroxyethoxy)methyl Purine Nucleoside Analogues, J. Med. Chem. 46 (2003) 5763-5772.
5. S. Raić-Malić, L. Tomašković, D. Mrvoš-Sermek, B. Prugovečki, M. Cetina, M. Grdiša, K. Pavelić, A. Mannschreck, J. Balzarini, E. De Clercq and M. Mintas. Spirobipyridopyrans, Spirobinaphthopyrans, Indolinospiropyridopyrans, Indolinospironaphthopyrans and Indolinospironaphtho-1, 4-oxazines: Synthesis, Study of X-Ray Crystal Structure and Antitumor Activities. *Bioorg. Med. Chem.* 12 (2004) 1037-1045.

Lecturer data	
Surname, Name	**PhD. Silvana Raić-Malić, assistant professor**
E-mail adress	sraic@fkit.hr
Course	**2.6. STEREOCHEMISTRY AND DRUG ACTION**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Silvana Raić-Malić was born in Požega, Croatia. Bachelor degree 1991, Faculty of Food Technology and Biotechnology. Master of science degree 1996, Faculty of Chemical Engineering and Technology. Ph. D. 1998, Faculty of Chemical Engineering and Technology, University of Zagreb. From 2004 - assistant professor, Faculty of Chemical Engineering and Technology. Postdoctoral specializations: Paul Scherrer Institute, Centre for Radiopharmacy, Villigen, Switzerland, 1999; Department for Pharmacy, ETH, Zürich, Switzerland, 2000-2001. Publications – two books: «Principles of Drug Design» and «Drugs: Pharmacophors and Receptors», 18 papers in scientific journals. Active participation in over 25 international and domestic conferences. Research field: development of drugs and prodrugs for gene therapy of cancer and synthesis of fluorinated acyclic nucleosides labelled with ^{18}F for potential application for imaging of malignant tumor by positron emission tomography.

Date of last election
29.03.2004.

Referent publications of lecturer

1. S. Raić-Malić, A. Hergold-Brundić, A. Nagl, M. Grdiša, K. Pavelić, E. De Clercq, M. Mintas: "Novel Pyrimidine and Purine Derivatives of L-Ascorbic Acid: Synthesis and Biological Evaluation", J. Med. Chem. 42 (1999) 2673-2678.
2. S. Raić-Malić, D. Svedružić, T. Gazivoda, A. Hergold-Brundić, A. Nagl, J. Balzarini, E. De Clercq, M. Mintas: "Synthesis and Biological Activities of Novel Pyrimidine Derivatives of 4, 5-Didehydro-5, 6-dideoxy-L-Ascorbic Acid", J. Med. Chem. 43 (2000) 4806-4811.
3. P. Pospisil, B. D. Pilger, P. Schelling, C. Wurth, L. Scapozza, G. Folkers, M. Pongracic, M. Mintas, S. Raić-Malić: Synthesis, Kinetics and Molecular Docking of Novel 9-Hydroxypropyl Purine Nucleoside Analogues as Ligands of Herpesviral Thymidine Kinases. Helv. Chim. Acta, 85 (2002) 3237-3250.
4. S. Prekupec, D. Svedružić, T. Gazivoda, D. Mrvoš-Sermek, A. Nagl, M. Grdiša, K. Pavelić, J. Balzarini, E. De Clercq, G. Folkers, L. Scapozza, M. Mintas, S. Raić-Malić. Synthesis and Biological Evaluation of Iodinated and Fluorinated 9-(2-Hydroxypropyl) and 9-(2-Hydroxyethoxy)methyl Purine Nucleoside Analogues, J. Med. Chem. 46 (2003) 5763-5772.
5. S. Raić-Malić, L. Tomašković, D. Mrvoš-Sermek, B. Prugovečki, M. Cetina, M. Grdiša, K. Pavelić, A. Mannschreck, J. Balzarini, E. De Clercq, M. Mintas. Spirobipyridopyrans, Spirobinaphthopyrans, Indolinospiropyridopyrans, Indolinospironaphthopyrans and Indolinospironaphtho-1, 4-oxazines: Synthesis, Study of X-Ray Crystal Structure and Antitumor Activities. Bioorg. Med. Chem. 12 (2004) 1037-1045.

Lecturer data	
Surname, Name	**PhD. Nikola Blažević, full professor**
E-mail adress	nblazevic@fbk.hr
Course	**2.7. ISOLATION AND APPLICATION OF NATURAL ORGANIC COMPOUNDS**
Institution	Faculty of Pharmacy and Biochemistry, Zagreb

Curriculum vitae

Nikola Blažević, born on 08. 12. 1939. in Moravice, and obtained in 1963 B. S. in chemical technology at Faculty of Technology, University of Zagreb. My first job was at Electrotechnical Institute of the factory „Rade Končar"(1963-1965), and after that in Pharmaceutical Work „Krka", Novo Mesto (1965-1968). In 1968 I have taken the assistant duties at the Faculty of Pharmacy and Biochemistry, Zagreb, where I accomplished my PhD. Later on I spent one year (1972/73) as postdoctoral fellow at the Department of Chemistry, University of Michigan, Ann Arbor, USA, and 1973/74 as Humboldt fellow at the Pharmaceutical Institute, University of Bonn, Germany. In the year 1975 I was appointed as assistant professor for the Medicinal chemistry, Faculty of Pharmacy and Biochemistry, University of Zagreb. In 1978 I left the Faculty, and was working as head of Laboratory of Pharmacopea and new methods, but the main job was to organize the Center for the control of doping in The Institute for the Control of Drugs in Zagreb. In 1984 started to work in chemical work „Chromos Aroma" on the development and production of fragrances and flavors, and in 1986 I was nominated as scientific consellor. From the year 1990 I am head of research and development of „Chromos Aroma" which after privatisation in 1993 was named „Ireks Aroma", where I am still employed as the head of research and development.

During the work in the field of the synthetic chemistry, I developed hexamine method for the synthesis of psychotropic agents of the 1, 4-benzodiazepines, and I was working also on the synthesis of different heterocyclic biologicaly active compounds. Since 1983 I studied different substances present in medicinal and aromatic plants, especially the components of essential oils as potential raw materials in the fragrance and flavor industry. In the period 1969 – 2002 I have published more than 70 scientific and 30 professional papers. In the same time I have delivered many lectures on the different profesional meetings or for the profesional association. I am also the author many of the patents for the synthesis of drugs.

Date of last election

Referent publications of lecturer

1. G. Stanić, N. Blažević, D. Brkić and G. Lukač. The Composition of essential oils of Calamintha nepeta (L.) Savi subsp. Glandulosa (Req.) P. W. Ball and Calamintha sylvatica Bromf. Subsp. Sylvatica Acta Pharm. 49 (1999) 107-112.
2. G. Stanić, N. Blažević, I. Bošnjak i Z. Ostojić. Analiza sadržaja i sastava eteričnog ulja u uzorcima kamilice uzgojene u Slavoniji. Farm. Glas. 56 (2000)139-147.
3. S. Vladimir-Knežević, N. Blažević, Z. Kalođera i D. Brkić. Promjene sastava eteričnog ulja biljne vrste Micromeria thymifolia (Scop.) Fritsch u eksperimentalnom uzgoju. Farm. Glas. 56 (2000) 329-334.
4. Ž. Maleš, N. Blažević and M. Plazibat. Variations in the yield and composition of the essential oil of Crithmum maritimum L. Acta Pharm. 51 (2001) 81–84.
5. S. Vladimir-Knežević, N. Blažević and Z. Kalođera. Seasonal variations in the content and composition of the essential oil of, Micromeria thymifolia (Scop.) Fritsch. Acta Pharm. 51 (2001) 147–151.

Lecturer data	
Surname, Name	**PhD. Miljenko Dumić, full professor**
E-mail adress	mdumic@pliva.hr
Course	**2.8. CHEMICAL DEVELOPMENT AND SCALE-UP IN DRUGS INDUSTRY**
Institution	Pliva, Zagreb

Curriculum vitae

Miljenko Dumić was born in Jastrebarsko, Croatia in 1947. He received his diploma degree (1972) and Master of Science degree (1977) from the Faculty of Technology, University of Zagreb. He completed his doctoral dissertation entitled „Synthetic Studies in the 1,3-Dioxepin Series. Preparation and Degradation of 1,3-Dioxepin Systems" in 1983 with Professor Ivan Butula at the Faculty of Pharmacy and Biochemistry, University of Zagreb,

After postdoctoral fellowship with Nobel Laureate Professor Vladimir Prelog at ETH, Zürich on the enantioselective transport through bulk liquid membrane (1983-1985) he moved back to the PLIVA, Bulk pharmaceuticals production, where he previously started as a process research & development engineer (1972-1985), and continued as a Leader of Developmental laboratory (1985-1989). Later on, he moved to PLIVA Research Institute as a Scientific associate (1990-1998), and subsequently as a Coordinator of Research & Development (1999-2001), Deputy of Director of Chemical Synthesis and Technology Department (2002-2003), Scientific Advisor in Research Institute (2004), and in PLIVA Research & Development Ltd (2004-).

He was a member of PLIVA Research Institute Scientific Board (1990-1994) and currently he is Scientific Board Chairman of PLIVA Research & Development Ltd. (2004-).

In 1986 he was elected for a position of Scientific Associate at the Faculty of Technology, and in 2003 for a position of Titular Associate Professor at the Faculty of Chemical Engineering and Technology, both at University of. Zagreb.

Professor Dumić's research interests center on the field of synthetic organic chemistry, from the preparation of novel substances as hits and leads, development and optimization of theirs and generic drugs synthetic procedures to the scale-up of those procedures from laboratory up to the production level. In the course of that, he introduced a study of polymorphism and pseudopolymorphism of drug substances in PLIVA. Recently, the new polymorph of diuretic torasemide, torasemide N, discovered and developed in his group was put on the US and European markets.

Prof. Dumić is the member of several professional and scientific Societies and the member of Editorial boards of the journals *Croatica Chemica Acta* and *Kemija u industriji.*

He is a coauthor of more than 40 scientific, professional and biographical papers and book chapters and more than 25 inventions protected with more than 50 patents all over the world.

Date of last election

Referent publications of lecturer

1. M. Dobler, M. Dumić, M. Egli, V. Prelog, "Chirale Poly(9, 9'-spirobifluoren)-kronenether", Angew. Chem. 97 (1985) 793-794; Angew. Chem. Int. Ed. Engl. 24 (1985) 792-794.
2. M. Dumić, D. Kolbah, D. K., K. K., Lj. Polak, "Hydrazone" in: "Houben-Weyl: Methoden der organischen Chemie", Band E-14, G. Thieme Verlag, Stuttgart, 1990, str. 434-631.
3. M. Dumić, M. Vinković, D. Filić, B. Jamnicky, M. Eškinja, B. Kamenar, "Antihyperglycemic 1-Sulfonyl-1a, 2, 6, 6a-tetrahydro-1H, 4H-[1, 3]-dioxepino[5, 6-b]azirines: Synthesis, X-ray Structure Analysis, Conformational Behavior, Quantitative Structure Property Relationships and Quantitative Structure Activity Relationships". J. Med. Chem. 38 (1995) 3034-3042.
4. P. Jakšić, K. Mlinarić-Majerski, B. Zorc and M. Dumić, "Macromolecular Prodrugs. VI. Kinetic Study of Poly-[α, β-(N-2-hydroxyethyl-DL-aspartamide)]-ketoprofen Hydrolysis", Int. J. Pharm. 135 (1996) 177-182.
5. A. Danilovski, D. Filić, M. Orešić, M. Dumić, "The Chemistry of Torasemide. Molecular and Crystal Structure of New Polymorph N", Croat. Chem. Acta, 74 (2001) 103-120.

Lecturer data	
Surname, Name	**PhD. Ljerka Duić, full professor**
E-mail adress	lduic@fkit.hr
Course	**3.1. ELECTRICALLY CONDUCTIVE POLYMERS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ljerka Duić graduated from the Faculty of Technology, University of Zagreb in 1960, and received Ph.D. degree in chemistry in 1964, also from the Faculty of Technology, University of Zagreb. Since 1988 she is full professor. She has published ca 100 scientific publications, 22 cited in tertiary scientific journals, participated in international scientific meetings with ca 20 presentations, and in domestic meetings with 40 presentations. She was a Chief researcher in 6 scientific projects and participated in a research in 5 scientific projects in the USA, and in 3 domestic scientific projects. She is also the author of 3 reviewed student textbooks published by "Liber". The area of scientific research: the investigation of electrochemical processes, especially in organic electrochemistry. Recently, in some ten years she carries out an intensive research in the electrochemistry of conductive polymers, their electrochemical synthesis and their applications in catalysis and in corrosion protection. She was a postdoctoral fellow at the University of Pennsylvania, Philadelphia, USA (1965-67), an invited scientist at State University of New York, NY. USA (1969-1971), and a visiting scientist at the University of Ottawa, Canada (1979-80).

Date of last election
12.01.1999**.**

Referent publications of lecturer

1. M. Sak-Bosnar, M.V. Budimir, S. Kovač, Lj. Duić: Chemical and Electrochemical Characterization of Chemically Synthesized Conducting Polypyrrole. *J.Polym.Sci., Part A*, 30 (1992) 1609.
2. Lj. Duić, Z. Mandić, F. Kovačiček: The effect of supporting electrolyte on the electrochemical synthesis, morphology and conductivity of polyaniline, *J. Polym. Sci*., 32 (1994) 105.
3. Z. Mandić, Lj. Duić: Polyaniline as an electrocatalytic material. *J.Electroanal.Chem*. 404 (1996) 133.
4. Z. Mandić,, Lj. Duić, F. Kovačiček: The influence of counter-ions on nucleation and growth of electrochemically synthesized polyaniline film. *Electrochim.Acta*, 42 (1997) 1389.
5. M. Kraljić, Z. Mandić, Lj. Duić: Inhibition of steel corrosion by polyaniline coatings *Corr. Science*, 45 (2003) 181.

Lecturer data	
Surname, Name	**PhD. Branko Kunst, emeritus**
E-mail adress	kunstb@fkit.hr
Course	**3.2. CHEMISTRY AND TECHNOLOGY OF MEMBRANES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Professor emeritus dr. Branko Kunst graduated from Technical Faculty, University of Zagreb in 1956. After three years' work in chemical industry in 1959 he moved to Faculty of Technology as a teaching assistant. He received his PhD in 1962 and in 1964 he was chosen to the post of assistant professor. In 1967 he became associate professor, and in 1972 full professor at the same Department. His main scientific interests is chemistry and technology of separation membranes. He was engaged in the field from 1962 and became one of the worldwide known scientist in preparation and characterization of separation membranes, and their practical application, particularly in the water treatment. For this work in 1998 he got the Croatian national award for the lifetime scientific contribution in technical sciences.

Date of last election

Referent publications of lecturer

1. K. Košutić, I. Novak, L. Sipos, B. Kunst. Removal of sulfates and other inorganics from potable water by nanofiltration membranes of characterized porosity. Separation and Purification Technology 37 (2004) 177–185.
2. K. Košutić, B. Kunst. RO and NF Membranes Fouling and Cleaning and Pore Size Distribution Variations. Desalination 150 (2002) 113-120.
3. K. Košutić, B. Kunst. Organics Removal from Aqueous Solutions by Commercial RO and NF Membranes of Characterized Porosities. Desalination 142 (2002) 47-56.
4. K. Košutić, B. Kunst. Effect of hydrolysis on porosity of cellulose acetate reverse osmosis membranes. J.Appl.Polym.Sci. 81 (2001) 1768-1775.
5. K. Košutić, L. Kaštelan-Kunst, B. Kunst. Porosity od some commercial reverse osmosis and nanofiltration polyamide thin-film composite membranes. J.Membrane Sci. 168 (2000) 101.
6. L. Kaštelan-Kunst, K. Košutić, V. Dananić, B. Kunst. FT30 membranes of defined porosities in the reverse osmosis organics removal from aqueous solutions. Water Res. 31 (1997) 2878.

Lecturer data	
Surname, Name	**PhD. Marica Ivanković, associate professor**
E-mail adress	mivank@fkit.hr
Course	**3.3. COMPOSITE MATERIALS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Marica Ivanković Education: B.Sc. 1985., M.Sc. 1988. and Ph.D. 1994. , University of Zagreb, Faculty of Chemical Engineering and Technology .
Research stays: From 1991.-1993. Universita degli Studi di Napoli , Dipartimento di Ingegneria dei Materiali e della Produzione, Italy.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1995-2000.); Associate professor (2000-)
Main research topics: thermodynamics of polymer solutions, curing kinetics and chemoreology of thermosets and thermoset matrix composites, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Membership: Croatian Society of Chemical Engineers, Society of Plastic and Rubber Engineers, Croatian Society for Materials and Tribology, Scientific Council for Petroleum of Croatian Academy of Arts and Sciences (HAZU).

Date of last election
25.09.2000.

Referent publications of lecturer

1. M. Opalički, J.M. Kenny and L. Nicolais. Cure Kinetics of Neat and Carbon-Fiber-Reinforced TGDDM/DDS Epoxy Systems, J.Appl.Polym.Sci.,61, (1996) 1025-1037.
2. J.M. Kenny and M. Opalički. Processing of Short Fibre-Thermosetting Matrix Composites, Composites, Part A, 27 A, (1996) 229-240.
3. M. Ivanković, L. Incarnato, J.M. Kenny, L. Nicolais. Curing kinetics and chemorheology of epoxy/anhydride system, J.Appl.Polym.Sci.,90, (2003) 3012-3019.
4. J. Macan, H. Ivanković, M. Ivanković, H.J. Mencer. Synthesis and characterization of organic-inorganic hybrids based on epoxy resin and 3-glycidyloxypropyltrimethoxysilane. J.Appl.Polym.Sci.,92 (1) (2004) 498-505.
5. J. Macan, H. Ivanković, M. Ivanković, H.J. Mencer. Study of cure kinetics of epoxy-silica organic-inorganic hybrid materials, Thermochimica Acta,, 414 (2004) 219-225.

Lecturer data	
Surname, Name	**PhD. Vera Kovačević, full professor**
E-mail adress	vkovac@fkit.hr
Course	**3.4. QUALITY OF ADHESION OF THIN FILMS AND COATINGS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Vera Kovačević was born in Zagreb. 1971. B.Sc. Faculty of Technology, University of Zagreb, 1983 Ph.D. From 1971- working at Faculty of Technology, from 1991. Faculty of Chemical Engineering and Technology (FKIT), University of Zagreb. Professor from1992. Specializations at Universities of Bath and Loughborough, UK. Foreign languages: English and German. The main fields of research interests are engineering of polymer materials, composites and blends, nanocomposites, surface engineering, aging and wearing of polymer materials. Published as author and co-author 98 papers; 57 scientific (37 CC cit.) and 41 profess. papers. Main researcher in 2 domestic- scientific and 2 foreign scientific projects. Mentor of several diploma. Magisterial and Ph.D. works. Involved with several subjects in under- and postgraduate education processes.

Date of last election
16.09.1997.

Referent publications of lecturer

1. V. Kovačević, D. Packham, S. Lučić, D. Hace, I. Šmit. Composites of Poly(Vinyl Acetate) Filled with Calcium Carbonate; Microscopy, Diffractometry and Thermophysical Properties, Polym.Eng.Sci., 39 (1998)1433-1443.
2. S. Lučić, V. Kovačević, D. Hace. Mechanical Properties of Adhesive Thin Films, Int. J. Adhes. Adhes. 18 (1998) 115-123.
3. V. Kovačević, S. Lučić, Ž. Cerovečki. Influence of Filler Pre-treatment on the Mechanical Properties of Composites, Int.J.Adhes. Adhes. 17 (1997) 239-245.
4. V. Kovačević, S. Lučić, D. Hace, A. Glasnović. Rheology and Morphology of Poly(Vinyl Acetate) Calcite Films, Polym.Eng.Sci., 36 (1996) 1134-1139.
5. M. Leskovac, V. Kovačević, S. Lučić Blagojević, D. Vrsaljko and V. Volovšek. Pre-treatment of $CaCO_3$ nanofiller by irradiation in the presence of vinyl monomers for the preparation of poly(vinyl acetate) composites, *e-Polymers* 2004, no. 033. ISSN 1618-7229 http://www.e-polymers.org

Lecturer data	
Surname, Name	PhD. Vesna Rek, full professor
E-mail adress	vrek@fkit.hr
Course	**3.5. SELECTED CHAPTERS OF STRUCTURE AND PROPERTIES OF POLYMER MATERIALS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Vesna Rek is professor at Faculty of Chemical Engineering and Technology, University of Zagreb. She is born in Zagreb. She obtained her B.Sc. degree (1965), M.Sc. degree (1972) and PhD degree (1997) from Faculty of Technology, University of Zagreb in the field of Chemical (Polymer) Engineering. Since 1965- 1967. she was working in industry. From 1967. she works at Faculty of Chemical Engineering and Technology, FKIT, in Department of Polymer Engineering and Organic Chemical Technology. From 1992. Vesna Rek is professor in technical science in the field of chemical engineering ,fields of material and analysis and synthesis of processes. Her scientific work is connected with polymeric materials, with interrelation between structure and properties in production and processing, its stability and changes in ageing processes. She is teaching at ungraduated and graduated study at FKIT-u. She works as a head at Project supported by Ministry of Science of Croatia. She published over fifty scientific and professional papers. Vesna Rek took part at many international and domestic meetings and conference, with papers and invited paper and took part in many elaborates for industry. She was mentor of a great number diplomas works and many magistrate work and dissertations. She was a member of organising committee and scientific committee and leader of many meetings and conferences.

Date of last election

Referent publications of lecturer

1. V. Rek, E. Govorčin. The morphological changes in segmented polyurethane under thermal tretment, Adv. Urethan. Sci. Tech., 11 (1992) 173.
2. V. Rek, D. Hace, M. Bravar, A. Jagodar. The thermal stability of rigid polyurethane foam in insulating pipes, Angew.Makromol.Chem., 176/177 (1990) 135.
3. V. Rek,.T. Holjevac-Grgurić, Ž. Jelčić. Effect of styrene-butadiene-styrene block copolymer on dynamic mechanical properties high-impact polystyrene, J.Macrom.Sci.Pure and Appl.Chem. A 35 (1998) 1385.
4. T. Holjevac-Grgurić, V. Rek, Ž. Jelčić, D. Hace, Z. Gomzi. Determination of the kinetic parameters of the thermal oxidative degradation of styrene butadiene copolymers, Polym.Eng.Sci., 39 (1999) 1394.
5. V. Rek, T. Holjevac-Grgurić, Ž. Jelčić. Creep Relaxation of PS-HI/SEBS Blends, Macromol. Symp. 202 (2003) 127.

Lecturer data	
Surname, Name	**PhD. Sanja Lučić Blagojević, assistant professor**
E-mail adress	slucic@fkit.hr
Course	**3.6. COMPOSITE ADHESIVE MATERIALS AND PRODUCTS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Sanja Lučić Blagojević was born in Zadar. 1991. B.Sc. Faculty of Technology ,University of Zagreb, 1999. Ph.D. at Faculty of Chemical Engineering and Technology University of Zagreb. From 1991- working at Faculty of Chemical Engineering and Technology (FKIT), University of Zagreb. Docent from1993. Specializations at University of Bath, UK. Foreign language: English. The main fields of research interests are engineering of polymer materials (filled polymer composite systems and blends), surface engineering (filler pre-treatments, adhesion, interphase in composites).Published as author and co-author 1 chap. in book, 15 scientific papers (9 CC cit.), involved in several international and domestic scientific conferences. The winer of the reward for representing the paper at Intern. Conf. on Polym. Charact., North Texas, 2002.

Date of last election
31.03.2003.

Referent publications of lecturer

1. S. Lučić Blagojević, V. Kovačević, M. Leskovac, D. Vrsaljko, V. Volovšek, Ch. Nover, Silane Pre-treatment of Calcium Carbonate Nanofillers for PU Composites, e-Polymers 2004, no. 036. ISSN 1618-7229 http://www.e-polymers.org
2. V.Kovačević, S. Lučić, M. Leskovac, Morphology and Failure in Nanocomposites Part I: Structural and Mechanical Properties, J.Adhes. Sci.Technol., 16 (2002) 1343-65.
3. V.Kovačević, M. Leskovac, S. Lučić, Morphology and Failure in Nanocomposites Part II: Surface Investigation, J. Adhes. Sci. Technol., 16 (2002) 1915-1929.
4. S. Lučić, V.Kovačević, D.E. Packham, A. Bogner, A.Geržina. Stearate-modified Calcium Carbonate Fillers and their Effect on the Properties of (PVAc) Composites, Ed.K.L.Mittal, Polymer Surface Modification,Vol.2,VSP,Utrecht, 2000, p.505-525.
5. S. Lučić, V.Kovačević, D.Hace. Mechanical Properties of Adhesive Thin Films, Int. J. Adhes. Adhes. 18 (1998) 115-123.

Lecturer data	
Surname, Name	**PhD. Franjo Ranogajec, full professor**
E-mail adress	
Course	**3.7. APPLIED RADIATION CHEMISTRY**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Franjo Ranogajec: Bachelor degree 1963, Faculty of Technology, Master of Science degree 1967, Faculty of Natural Sciences, University of Zagreb; Ph.D. 1972, Institute of Chemical Physics, Academy of Sciences USSR, Moscow. Since 1992 senior scientist in Radiation Chemistry and Dosimetry Laboratory, Division of Materials Chemistry, Ruđer Bošković Institute, Zagreb. Field of research: Kinetics and mechanism of polymerization and copolymerization, high conversion polymerization; Radiation modification of polymers. Publishing 50 scientific papers in CC journals, and 20 elsewhere. Projects: Principal investigator of 10 projects financed by the Croatian authorities. Implementation of 4 projects of technical assistance of International Atomic Energy Agency (IAEA) in Croatia: "Radiation polymerization" 1978-1980; "Replenishment of Co-60 source" 1980-1982; "Scale up of semi-industrial gamma radiation facility" 1989-1991.; "Radiation processing facility" 1999-2003. Principal investigator of 2 research projects supported by the IAEA: "In source analysis of radiation curing of unsaturated polyester resins" 1990-1993; "Improvement of the polymer stability and fire retardacy by radiation grafting" 1994-1997. Expertise: Invited IAEA expert mission in Portugal 1993, 1994, project: "Setting up a radiation polymer laboratory" and in Pakistan 1997, project "Radiation processing of cable insulation materials". Bilateral cooperation with Hungary, USA, Slovenia. Award of the Institute of Chemical Physics, Moscow, 1972.

Date of last election

Referent publications of lecturer

1. I. Pucić, F. Ranogajec: Upper liquid-liquid transition in unsaturated polyesters. J. Polym. Sci.- part B: Polym. Phys. 39 (2001) 566-580.
2. I. Pucić, F. Ranogajec: Investigation of upper liquid-liquid transition in unsaturated polyesters by near infrared spectroscopy. Macromol. Chem. Phys. 202 (2001) 1844-1854.
3. M. Denac, V. Musil, I. Šmit, F. Ranogajec: Effects of talc and gamma irradiation on mechanical properties and morphology of isotactic polypropylene(talc composites). Polym. Degrad. Stab. 82 (2003) 263-270.
4. F. Ranogajec, M. Mlinac-Mišak: Improvement of the polymer stability by radiation grafting. Radiat. Phys. Chem. 71 (2004) 229-233.

Lecturer data	
Surname, Name	**PhD. Ante Jukić, asisstant professor**
E-mail adress	ajukic@fkit.hr
Course	**3.8. PETROCHEMISTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ante Jukić was born in Vukovar, Croatia, in 1971. He graduated 1997. with excellent grade at Faculty of chemical engineering and technology, University of Zagreb, and 1998. he joined the same Faculty as a research assistant. He received M. Sc. degree in 2001. for work Kinetics and mechanism of the electrochemical H2 evolution reaction on the Ni (Co) / Zr metallic glasses and Ph. D. in chemical engineering 2004. for work Optimization of manufacturing process and properties of lubricating mineral oil polymeric additives from University of Zagreb. As a coauthor he published 22. scientific papers in journals, books and conference proceedings, and participate in making out five expertise elaborates. In addition, he attained 20. domestic and international meetings (five oral lectures, two invited). From July 2003. to October 2003. he was doing scientific training at Max Planck Institute in Mainz, Germany. His scientific work was awarded with the University Dean award (1997.), Society of university teachers and other scientists in Zagreb award (2001.) and Croatian Academy of Engineering award (2004.).

Date of last election
5.11.2001.

Referent publications of lecturer

1. Jukić, Ante; Tomašek, Ljubica; Janović, Zvonimir. Polyolefine and poly(alkyl methacrylate) mixed additives as lubricating mineral oil rheology modifiers. // Lubrication Science. (2005), u tisku.
2. Janović, Zvonimir; Jukić, Ante; Vidović, Elvira; Tomašek, Ljubica. Reakcije i procesi usmjerenih radikalskih polimerizacija // Polimeri. 25 (2004) 68-76.
3. Jukić, Ante; Rogošić, Marko; Bolarić, Iva; Tomašek, Ljubica; Janović, Zvonimir. Viscometric study of miscibility and interactions of some polyolefin and poly(alkyl methacrylates) in dilute xylene solutions. // Journal of Molecular Liquids. 112 (2004) 161-169.
4. Janović, Zvonimir; Jukić, Ante; Vidović, Elvira; Romano, Jakov; Barišić, Ankica; Picek, Meri. Polimerni aditivi mineralnih mazivih ulja na temelju terpolimera alkil-metakrilata i stirena. // Goriva i maziva. 43 (2004) 87-108.
5. Jukić, Ante; Rogošić, Marko; Sarić, Karla; Janović, Zvonimir. Optimizacija procesa terpolimerizacije i svojstava polimera na temelju alkil-metakrilata u otopini. // Kemija u industriji. 52 (2003) 473-481.

Lecturer data	
Surname, Name	**PhD. Ivan Šmit, full professor**
E-mail adress	
Course	**3.9. STRUCTURE OF POLIMERIC MATERIALS**
Institution	Ruder Boskovic Institute, Zagreb

Curriculum vitae

Ivan Šmit: Bachelor degree 1971, Faculty of Technology, Master of Science degree 1974, The University of Zagreb, Ph. D. 1979, Faculty of Science with thesis „Structural changes in the system polyethylene-styrene“. Since 2003 - Senior Research Associate in Division of Materials Chemistry, Ruđer Bošković Institute, Zagreb. Publications: 44 scientific papers in journals, series and books (cited by CC), 3 chapters in books, 13 scientific papers in other journals, 11 educational papers, 1 patent, and 38 applied and popular papers. Main research activities: (i) investigation of phase structures and phase transitions, (ii) studying of supermolecular structure and morphology of multiphase and multicomponent polymer systems as well as similar compound systems. Participitation in several scientific projects. Principal investigator in bilateral Croatian-Slovenian colaboration "Modified polymeric materials". Other activities: editor-assistant (1980-1983) and editor-in-chief of journal *Polimeri*, DPG, Zagreb (1983-1986). Activities in polymer terminology. Referee for several journals. Member of several scientific societies.

Date of last election

Referent publications of lecturer

1. I. Šmit, V. Musil, I. Švab: Effects of EPDM and Wollastonite on Structure of Isotactic Polypropylene Blends and Composites. J. Appl. Polym. Sci. 91 (2004) 4072-4081.
2. M. Denac, V. Musil, I. Šmit: Structure and Mechanical Properties of Talc_Filled Blends of Polypropylene and Styrenic Block Copolymers. J. Polym. Sci., Polym. Phys., 42 (2004) 1255-1264.
3. M. Sikirić, I. Šmit, Lj. Tušek-Božić, V. Tomašić, I. Pucić, I. Primožić, N. Filipović-Vinceković: Effect of Spacer Length on the Solid Phase Transitions of Dissymmetric Gemini Surfactants. Langmuir 19 (2003) 10044-10053.
4. G. Radonjič, I. Šmit: Phase Morphology and Mechanical Properties of iPP/SEP Blends. J. Polym. Sci., Part B: Polym. Phys., 39 (5) (2001) 566 -580.
5. I. Šmit, G. Radonjič: Effects of SBS on phase morphology of the iPP/aPS blends. Polym. Eng. Sci. 40 (2000) 2144-2160.

Lecturer data	
Surname, Name	**PhD. Štefica Cerjan- Stefanović, full professor**
E-mail adress	scerjan@fkit.hr
Course	**4.1. CHEMISTRY AND TECHNOLOGY OF NATURALE ZEOLITES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Štefica Cerjan-Stefanović was born 19. September 1939. in Zagreb, Croatia.
B.C.E.: 19. April 1963, M.Sc.: 16. December 1968. and Ph.D.: 11. december 1973. on Faculty of Technology, University of Zagreb. Mentor of PhD was Ph.D. Vjera Marjanović - Krajovan, professor, "Distribution of some chemical elements in iron materials".
Work experience: Since 1. December 1963. work at Laboratory for Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, as follows: assistant 1975. - 1977.; Docent 1977.-1983.; professor since 1983. Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph.D. I. Incedya, professor.
Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia. Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ. Work experience: From 1. December 1963. until now work at Laboratory for Analytical Chemistry, Faculty of Chemical Engineering and Technology, University of Zagreb, as follows: assistant 1975. - 1977.; Docent 1977.-1983.; 1983. until now professor. Post doctoral studies: 1985. and 1987. Department of Analytical Chemistry, L. Eotvos, University - Budapeste. Mentor: Ph.D. I. Incedya, professor. Scientific publications: 70 scientific publications in journals, 50 internationl conferences, 50 conferences in Croatia. Projects: President of projects: "Ion Exchangers in Prevention of Pollution of Chemical Industry Waters", and "Chromatography in Water Analysis (CRO-SLO colaboration)", financed by Ministry of Science and Technology, Republic of Croatia. Social activities: President of AMACIZ, member of CCS, CSCI, Academy of Science NY and IAWQ.

Date of last election
10.11.1998.

Referent publications of lecturer

1. Ž. Grahek, S. Lukić, K. Košutić, I. Eškinja, Š. Cerjan-Stefanović, Separation of Radioactive Stroncium from Natural Samples by means of Mixed-solvent Anion Exchange, Journal of Radioanalytical and Nuclear Chemistry, 189(1) (1995) 140.
2. S. Leaković, I. Mijatović, Š Cerjan-Stefanović, E. Hodžić, Nitrogen Remuval from Fertilizer Wastewater by Ion Exchange, Water Research A Journal of the International Water Association, 34(1) (2000) 185.
3. M. Rožić, Š. Cerjan-Stefanović, S. Kuraica, V. Vančina, E. Hodžić, Ammoniacal Nitrogen Remuval from Water by Treatment with Clays and Zeolites, Water Research A Journal of the International Water Associationm, 34(14) (2000) 3675.
4. Š.Cerjan – Stefanović, T.Bolanča, L.Ćurković, Simultaneous Determination of six Inorganic Anions in Drinking Water by Non-Suppressed Ion Chromatography, Journal of Chromatography A, 918 (2001) 325.
5. M. Rožić, Š. Cerjan – Stefanović, L. Ćurković, Evaluation of Croatian Clinoptilolite and Montmorillite – rich Tuffs for Ammonium Remuval, Croatica Chemica Acta, 75(1) (2002) 255-269.

Lecturer data
Surname, Name **PhD. Boris Subotić**
E-mail adress
Course **4.2. CHEMISTRY AND TECHNOLOGY OF ZEOLITES**
Institution Ruder Boskovic Institute, Zagreb

Curriculum vitae

Boris Subotić was born on December 2, 1946 in Dugo Selo, Croatia. Married, one child
EDUCATION: 1969. B.S. at Faculty of science, University of Zagreb, 1972 M.Sc at Faculty of science, University of Zagreb and 1976. Ph.D at Faculty of science, University of Zagreb.
APPOINTMENTS:
1969 - Appointment as Research Assistant at the Rudjer Bošković Institute, Zagreb, Croatia
1981 - Promoted to position of Research Associate (Assistant Professor) at the Rudjer Bošković Institute, Zagreb, Croatia
1986 - Promoted to the position of Senior Research Associate (Associate Professor) at the Rudjer Bošković Institute, Zagreb, Croatia
1993 - Promoted to the position of Senior Scientist (Full Professor) at the Rudjer Bošković Institute, Zagreb, Croatia
1998 - Promoted to the permanent position of Senior Scientist (Full Professor) at the Rudjer Bošković Institute, Zagreb, Croatia
MAIN RESEARCH TOPICS:
- formation of solid phase from electrolytic solutions
- modeling of the crytical processes (formation and dissolution of gel, nucleation and crystal growth of zeolites) of zeolite crystallization as well as theirn thermal and hydrotherand transformations
- use of zeolites as ion-exchangers for application in laundry detergents, and puriffication of waste waters

Date of last election

Referent publications of lecturer

1. S.Bosnar and B. Subotić. Kinetic Analysis of Crystal Growth of Zeolite A, Croatica Chemica Acta, 75 (2002) 663-681.
2. C. Kosanović, B. Subotić and A. Ristič. Structural Transformations of the (NH_4,Na)-Exchanged Zeolites 4A. 13X and Synthetic Mordenite by Thermal Treatment, Croatica Chemica Acta, 75 (2002) 783-792.
3. T. Antonić-Jelić, S. Bosnar, J. Bronić and B. Subotić. Experimental Evidence of the «Memory» Effect of Amorphous Aluminosilicate Gel Precursors, Microporous and Mesoporous Materials, 64(1-3) (2003) 21-32.
4. C. Kosanović and B. Subotić. Preparation of Mullite Micro-vessels ba a Combined Treatment of Zeolites, Microporous and Mesoporous Materials, 66(2-3) (2003) 311-319.
5. I. Krznarić, T. Antonić, J. Bronić, B. Subotić and R.W. Thompson. Influence of Silica Sources on the Chemical Composition of Aluminosilicate Hydrogels and the Results of Their Hydrothermal Treatment, Croatica Chemica Acta, 76(3) (2003) 7-17.

Lecturer data	
Surname, Name	**PhD. Hrvoje Ivanković, associate professor**
E-mail adress	hivan@fkit.hr
Course	**4.3. CERAMICS AND NEW CERAMIC PROCESSING**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Hrvoje Ivanković: Education: B.Sc. 1982., M.Sc. 1990. and Ph.D. 1997. University of Zagreb, Faculty of Chemical Engineering and Technology.
Research stays: From 1991.-1995. Institutu fuer Neue Materialien, Saarbruecken, Germany.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1997-2002.); Associate Professor (2002)
Main research topics: solid state kinetics, ceramic and glass-ceramics microstructure and properties, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Publications: author and co-author of 30 scientific papers.
Membership: Croatian Society of Chemical Engineers, Croatian Society for Materials and Tribology, Croatian Crystallographic Society.

Date of last election
23.09.2002.

Referent publications of lecturer

1. H. Ivanković, E. Tkalčec, R. Rein, H. Schmidt, Influence of Alumina Precursors on Microstructure and Creep Behavior of Sol-Gel Derived Mullite Ceramics, Key Engineering Materials Vols. 264-268 (2004) 997-1000.
2. J. Macan, H. Ivanković, M. Ivanković, H. J. Mencer, Synthesis and Characterization of Organic-Inorganic Hybrids Based on Epoxy Resin and 3-Glycidyloxypropyltrimethoxysilane, J. Appl. Polym. Sci. 92 (2004) 498-505
3. E. Tkalčec, H. Ivanković, R. Nass, H. Schmidt, Crystallization kinetics of mullite formation in diphasic gels containing different alumina components, J. Eur. Ceram. Soc., 23 (2003), 1465.
4. H. Ivanković, E. Tkalčec, R. Nass, H. Schmidt, Correlation of the precursor type with densification behavior and microstructure of sintered mullite ceramics, J. Eur. Ceram. Soc., 23 (2003), 283-292
5. R. Nass, E. Tkalčec, H. Ivanković, Chromium Doped Single-Phase Mullite Gels, J. Am. Ceram. Soc., 78 (1995) 3072-87.

Lecturer data	
Surname, Name	**PhD. Stanislav Kurajica, associate professor**
E-mail adress	stankok@fkit.hr
Course	**4.4. SILICATE CHEMISTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Stanislav Kurajica was born in Dubrovnik on December, 24. 1965. He accomplished primary and secondary education in Dubrovnik. In period 1985. to 1991. he studied Chemical technology at Faculty of technology of University of Zagreb. In 1995. he recieved Ms degree and 1998. PhD degree at Faculty of Chemical Engineering and Technology, University of Zagreb. From 1991. he works at Department of inorganic chemical technology and non-metals of the Faculty of Chemical Engineering and Technology in Zagreb. In 1999. he was appointed at assistant professor position. Scientific activity of S. Kurajica is focused on solid-state reactions and kinetics, new ceramic and glass-ceramic materials and cement. At present he is teaching courses: Reactions in the solid state, The chemistry of silicates and Water treatment processes. S. Kurajica published 18 scientific papers, 13 of them in international journals and participated in five scientific ant technological projects.

Date of last election
21.06.2004.

Referent publications of lecturer

1. H. Ivanković, S. Kurajica, E. Tkalčec, The influence of B2O3 on the crystallization kinetics in zinc-aluminosilicate glasses, Glass Science & Technology, 75 (Suppl S): 2002, 314-317
2. S. Kurajica, H. Ivanković, E. Tkalčec, Non-isothermal crystallization kinetics of Li2O-ZnO-Al2O3-B2O3-SiO2 glass, Glass Science & Technology, 75 (Suppl S): 2002, 370-373.
3. E. Tkalčec, S. Kurajica, H. Ivanković, Isothermal and non-isothermal crystallization kinetics of zinc-aluminosilicate glasses, Termochim. Acta, 378 (2001), 135.
4. Bezjak, E. Tkalcec, H. Ivankovic, M. Ereš, Determination of kinetic parameters for nucleation and growth from DTA data, Termochim. Acta, 221 (1993), 23.
5. Tkalčec, H. Ivanković, B. Gržeta, Crystallization of High-Quartz Solid Solution in GahniteGlass-Ceramics, J. Non-Cryst. Solids, 129 (1991) 174.

Lecturer data	
Surname, Name	**PhD.Hrvoje Ivanković, associate professor**
E-mail adress	hivan@fkit.hr
Course	**4.4. SILICATE CHEMISTRY**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Hrvoje Ivanković: Education: B.Sc. 1982., M.Sc. 1990. and Ph.D. 1997. , University of Zagreb, Faculty of Chemical Engineering and Technology.
Research stays: From 1991.-1995. Institutu fuer Neue Materialien, Saarbruecken, Germany.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1997-2002.); Associate Professor (2002)
Main research topics: solid state kinetics, ceramic and glass-ceramics microstructure and properties, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Publications: author and co-author of 30 scientific papers.
Membership: Croatian Society of Chemical Engineers, Croatian Society for Materials and Tribology, Croatian Crystallographic Society.

Date of last election
23.09.2002.

Referent publications of lecturer

1. E. Tkalčec, H. Ivanković, R. Nass, H. Schmidt, Crystallization kinetics of mullite formation in diphasic gels containing different alumina components, J. Eur. Ceram. Soc., 23 (2003), 1465
2. H. Ivanković, E. Tkalčec, R. Nass, H. Schmidt, Correlation of the precursor type with densification behavior and microstructure of sintered mullite ceramics, J. Eur. Ceram. Soc., 23 (2003), 283-292
3. H. Ivanković, S. Kurajica, E. Tkalčec, The influence of B2O3 on the crystallization kinetics in zinc-aluminosilicate glasses, Glass Science & Technology, 75 (Suppl S): 2002, 314-31.
4. E. Tkalčec, S. Kurajica, H. Ivanković, Isothermal and non-isothermal crystallization kinetics of zinc-aluminosilicate glasses, Termochim. Acta, 378 (2001), 135.
5. J. Macan, H. Ivanković, M. Ivanković, H. J. Mencer, Synthesis and Characterization of Organic-Inorganic Hybrids Based on Epoxy Resin and 3-Glycidyloxypropyltrimethoxysilane, J. Appl. Polym. Sci. 92 (2004) 498-505.

Lecturer data
Surname, Name **PhD. Goran Štefanić**
E-mail adress
Course **4.5. USE OF COMPUTER TECHNIQUES IN THE DIFFRACTION ANALYSIS OF THE MATERIALS**
Institution Insitute Ruđer Boškovic, Zagreb

Curriculum vitae

Goran Štefanić was born on December 23rd 1967 in Zagreb. In 1992 he graduated chemistry at the Faculty of Science, University of Zagreb under the supervision of Prof. Dr. Nikola Kallay. Since 1992 Goran Štefanić work at the Rudjer Boskovic Institute, Laboratory for the Synthesis of New Materials (LSNM). In 1997 he received Ph.D. degree in physical chemistry from the Faculty of Sciences, University of Zagreb. Doctoral thesis under the title ”Chemical and structural properties of ZrO_2 and the systems ZrO_2-M_2O_3, M = Al, Fe, Cr" was performed under the supervision of Dr. Svetozar Musić. Goran Štefanić participate in the undergraduate teaching program at the Faculty of Science and at the Faculty of Textile and Technology (laboratory exercises in the curse of Physical Chemistry). From 2001 he works as a research associate at the Ruđer Bošković Institute. In the school year 2002/2003 he worked as a visiting professor at the Department of Physics and Astronomy, University of Denver, Denver, Colorado, where he specialize application of Ritveld method in the analysis of defect crystal structures. Dr. sc. Goran Štefanić is a member of editorial board of Croatica Chemica Acta and referee for journals J. Solid State Chem. and Croat. Chem. Acta. He published 26 papers in the journals cited by Current Contents and give to invited lectures; one in Berlin and one in Zagreb.
Research interests**:** (a) application of Rietveld refinement of the powder diffraction data in the analysis of structural defects, (b) nucleation and crystal growth during the thermal and hydrothermal processing of the amorphous precursor to the metal oxide ceramics, (c) the influence of aliovalent cations on the structural and microstructural properties of ceramic materials.

Date of last election

Referent publications of lecturer

1. Ken Gall, Martin Dunn, Yiping Liu, Goran Štefanić, Davor Balzar, “Internal stress storage in shape memory polymer nanocomposites”, Appl. Phy. Lett.. 85 (2004) 290.
2. Goran Štefanić and Svetozar Musić, Factors influencing the stability of low temperature tetragonal ZrO_2, Croat. Chem. Acta., 3 (2002) 727-767.
3. Goran Štefanić, Biserka Gržeta, K. Nomura, R. Trojko and Svetozar Musić, The influence of thermal treatment on the phase development in ZrO_2-Fe_2O_3 and HfO_2-Fe_2O_3 systems, J. Alloys Comp. 327 (2001) 151.
4. Goran Štefanić, Stanko Popović and Svetozar Musić, Influence of Cr_2O_3 on the stablity of low temperature t-ZrO_2, Mater. Lett. 36 (1998) 240.
5. Goran Štefanić, Stanko Popović and Svetozar Musić, Influence of pH on the hydrothermal crystallization kinetics and crystal structure of ZrO_2, Thermochim. Acta., 303 (1997) 31.

Lecturer data	
Surname, Name	**PhD. Hrvoje Ivanković, associate professor**
E-mail adress	hivan@fkit.hr
Course	**4.6. STRUCTURE AND PROPERTIES OF INORGANIC GLASSES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Hrvoje Ivanković: Education: B.Sc. 1982., M.Sc. 1990. and Ph.D. 1997. , University of Zagreb, Faculty of Chemical Engineering and Technology.
Research stays: From 1991.-1995. Institutu fuer Neue Materialien, Saarbruecken, Germany.
Position: Faculty of Chemical Engineering and Technology, University of Zagreb: Assistant Professor (1997-2002.); Associate Professor (2002)
Main research topics: solid state kinetics, ceramic and glass-ceramics microstructure and properties, synthesis and characterization of organic-inorganic hybrids and nanocomposites.
Publications: author and co-author of 30 scientific papers.
Membership: Croatian Society of Chemical Engineers, Croatian Society for Materials and Tribology, Croatian Crystallographic Society

Date of last election
23.09.2002.

Referent publications of lecturer

1. H. Ivanković, S. Kurajica, E. Tkalčec, The influence of B2O3 on the crystallization kinetics in zinc-aluminosilicate glasses, Glass Science & Technology, 75 (Suppl S): 2002, 314-317
2. S. Kurajica, H. Ivanković, E. Tkalčec, Non-isothermal crystallization kinetics of Li2O-ZnO-Al2O3-B2O3-SiO2 glass, Glass Science & Technology, 75 (Suppl S): 2002, 370-373.
3. E. Tkalčec, S. Kurajica, H. Ivanković, Isothermal and non-isothermal crystallization kinetics of zinc-aluminosilicate glasses, Termochim. Acta, 378 (2001), 135.
4. A. Bezjak, E. Tkalcec, H. Ivankovic, M. Ereš, Determination of kinetic parameters for nucleation and growth from DTA data, Termochim. Acta, 221 (1993), 23.
5. E. Tkalčec, H. Ivanković, B. Gržeta, Crystallization of High-Quartz Solid Solution in GahniteGlass-Ceramics, J. Non-Cryst. Solids, 129 (1991) 174.

Lecturer data	
Surname, Name	**PhD. Stanislav Kurajica, associate professor**
E-mail adress	stankok@fkit.hr
Course	**4.6. STRUCTURE AND PROPERTIES OF INORGANIC GLASSES**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Stanislav Kurajica was born in Dubrovnik on December, 24. 1965. He accomplished primary and secondary education in Dubrovnik. In period 1985. to 1991. he studied Chemical technology at Faculty of technology of University of Zagreb. In 1995. he recieved Ms degree and 1998. PhD degree at Faculty of Chemical Engineering and Technology, University of Zagreb. From 1991. he works at Department of inorganic chemical technology and non-metals of the Faculty of Chemical Engineering and Technology in Zagreb. In 1999. he was appointed at assistant professor position. Scientific activity of S. Kurajica is focused on solid-state reactions and kinetics, new ceramic and glass-ceramic materials and cement. At present he is teaching courses: Reactions in the solid state, The chemistry of silicates and Water treatment processes. S. Kurajica published 18 scientific papers, 13 of them in international journals and participated in five scientific ant technological projects.

Date of last election
21.06.2004

Referent publications of lecturer

1. H. Ivanković, S. Kurajica, E. Tkalčec, The influence of B2O3 on the crystallization kinetics in zinc-aluminosilicate glasses, Glass Science & Technology, 75 (Suppl S): 2002, 314-317
2. S. Kurajica, H. Ivanković, E. Tkalčec, Non-isothermal crystallization kinetics of Li2O-ZnO-Al2O3-B2O3-SiO2 glass, Glass Science & Technology, 75 (Suppl S): 2002, 370-373.
3. E. Tkalčec, S. Kurajica, H. Ivanković, Isothermal and non-isothermal crystallization kinetics of zinc-aluminosilicate glasses, Termochim. Acta, 378 (2001), 135.
4. Bezjak, E. Tkalcec, H. Ivankovic, M. Ereš, Determination of kinetic parameters for nucleation and growth from DTA data, Termochim. Acta, 221 (1993), 23.
5. Tkalčec, H. Ivanković, B. Gržeta, Crystallization of High-Quartz Solid Solution in GahniteGlass-Ceramics, J. Non-Cryst. Solids, 129 (1991) 174.

Lecturer data	
Surname, Name	**PhD. Juraj Šipušić, assistant professor**
E-mail adress	jsipusic@fkit.hr
Course	**4.7. CEMENT**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Juraj Šipušić was born 15.05.1974. in Zagreb. B.S. Degree 1997. M.Sc. Degreee 2001. Ph.D. 2004. Faculty of Chemical Engineering and Technology, University of Zagreb. Job record: 1998- assistent at the Faculty of Chemical Engineering and Technology, University of Zagreb. Scientific record: published four papers in Journals CC cited, one paper is in review process and ten scientific papers published in Proceedings from international and domestic congresses. Participate in the work on two scientific and two technological projects.

Date of last election
21.06.2004.

Referent publications of lecturer

1. Bezjak, S. Kurajica and J. Šipušić, A new approach to solid-state reactions kinetics analysis: the application of assisting functions to basic equations for isothermal conditions, Thermochimica Acta, 386 (2002) 81-90.
2. T. Matusinović, J. Šipušić and N. Vrbos, Porosity–strength relation in calcium aluminate cement pastes, Cement and Concrete Research, 33 (2003) 1801-1806.
3. T. Matusinović, S. Kurajica and J. Šipušić, The correlation between compressive strength and ultrasonic parameters of calcium aluminate cement materials, Cement and Concrete Research, 34 (2004)1451-1457
4. J. Šipušić, S. Kurajica, A. Bezjak, Method for induction time determination using data obtained from isothermal crystallization experiment monitored by DSC. J. Appl. Polym. Sci. 93 (2004) 2454-2458.
5. T. Matusinović, N. Vrbos and J. Šipušić, Rapid Setting and Hardening High Alumina Cement Materials.

Lecturer data	
Surname, Name	**PhD. Mirjana Metikoš-Huković, full professor**
E-mail adress	mmetik@fkit.hr
Course	**4.8. SEMICONDUCTOR MATERIALS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Mirjana Metikoš-Huković is full professor of electrochemistry at the University of Zagreb, Faculty of chemical engineering. She received a PhD degree of Chemistry in 1975. with the thesis "Electrochemical study of the system valve metal - electrolyte", an MS degree in 1965. with the thesis " Impedance study of a passive iron electrode", both at the University of Zagreb, the Faculty of Technology, under the supervision of professor Branko Lovreček.

She worked three years as a visiting scientist at the Dechema Institute in Frankfurt/M, BRD, before taking up a faculty position in the Department of Electrochemistry at Faculty of Technology in 1971. Attended postdoctoral study at the Fritz Haber Institute in Berlin, BRD (1977.-1979.), and in 1993. was a visiting professor at the Institute of Energy Process Engineering Research Centre, Jülich, BRD.

Dr. Metikoš has published (authored or coauthored) of more than 100 reviewed research papers in top chemistry journals that were cited over 880 times, and has coauthored two chapters in books published by Marcel Decker.Dr. Metikos is principal scientist of many domestic and international projects, and also has been a mentor on numerous graduation, master and doctoral thesis at her faculty, University of Split, University of Osijek.

The thrust of Dr. Metikoš's research has been the application of the solid-state and surface science to the fundamental aspects of passivity of metals and alloys, corrosion and inhibition protection, photoelectrochemistry and electrochemistry of semiconductors. Currend research involves study of surface properties of interfaces in regard to catalysis, fuel cells, hydrogen energy, involved "green" electrochemistry, electrochemical development of surface structure; self assembled monolayer of alkanethiols, metal nanoparticles.

Mirjana Metikoš-Huković is a member of many domestic and international societies, referee of distinguished journals in the field of electrochemistry, electrocatalysis and corrosion.

Date of last election

12.01.1999.

Referent publications of lecturer

1. M. Metikoš-Huković, Z. Grubač. Characterization of Electronic and Dielectric Properties of Anodic Oxide Films on Bismuth by Electrochemical Impedance Spectroscopy. J. Phys. Chem., 102 (1998) 8050.
2. M. Metikoš-Huković, S. Omanović. Thin Indium Oxide Films Formation and Growth: Impedance Spectroscopy and Cyclic Voltammetry Investigations. J. Electroanal. Chem., 455 (1998) 105.
3. M. Šeruga, M. Metikoš-Huković, T. Valla, M. Milun, H. Hoffschultz, K. Wandelt. Electrochemical and X-ray Photoelectron Spectroscopy Studies of Passive Film on Tin. J. Electroanal. Chem. 407 (1996) 83.
4. S. Omanović, M. Metikoš-Huković. The Ionic Conductance of Barrier-Type Anodic-Oxide Growth on Indium. Solid State Ionics, 78 (1995) 69.
   S. Omanović, M. Metikoš-Huković. Thin Oxide Films on Indium: Impedance Spectroscopy Investigation of Reductive Decomposition. Thin Solid Films 266 (1995) 31.

Lecturer data	
Surname, Name	**PhD. Sanja Martinez, assistant professor**
E-mail adress	smartin@fkit.hr
Course	**5.1. MATERIALS CORROSION AND COMPUTER MODELING IN CORROSION**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Sanja Martinez (Rešetić) was born in Zagreb, Croatia, 23rd December 1968. Graduated from the Engineering Physics Department of the Faculty of Mathematics and Natural Sciences in Zagreb in 1993. Employed at the Faculty of Chemical Engineering and Technology in Zagreb from ac.year.1993/94. Thesis "Investigation of tannin as an inhibitor steel corrosion", 26. May 2000. Assistant professor from June 2003. Published 11 scientific papers, and authored a number of contributions in the form of posters and oral presentations at domestic and international congresses. Has been collaborator on two scientific projects and is presently the principal investigator of the scientific project entitled "Experimental Investigation and Mathematical Models of the Corrosion Protection Systems ". Coauthor of the textbook "Corrosion and Protection-Experimental Methods" and the appending Web-based textbook. Active member of a few domestic and international professional associations and member of the two Technical comities – "Corrosion and protection" and "Paints and Varnishes" at the State Office for Standardization and Metrology.

Date of last election
16.06.2003**.**

Referent publications of lecturer

1. S. Martinez, M. Metikoš-Huković. A Nonlinear Kinetic Model Introduced for the Corrosion Inhibitive Properties of Some Organic Inhibitors, J. Appl. Electochem. 33 (2003) 1137.
2. S. Martinez, I. Štagljar. Correlation between the molecular structure and the corrosion inhibition efficiency of chestnut tannin in acidic solutions, Journal of Molecular Structure: Theochem 640 (2003) 167-174.
3. S. Martinez, Inhibitory mechanism of mimosa tannin using molecular modeling and substitutional adsorption isotherms, Materials Chemistry and Physics 77 (2003) 97-102.
4. S. Martinez, I. Štern. A Mathematical Model for the Internal Cathodic Protection of Cylindrical Structures by Wire Anodes, J. Appl. Electrochem. 30 (2000) 1053-1060.
5. I. Kokanović, B. Leontic, J. Lukatela, S. Rešetić, E. Girt. Hydrogen induced changes in temperature dependence of the resistivity in Zr-Fe metallic glasses, Solid State Communications 94 (1995) 217-220.

Lecturer data	
Surname, Name	**PhD. Antonija Meštrović Markovinović, assistant professor**
E-mail adress	amarko@fkit.hr
Course	**5.2. CORROSION PROTECTION OF MATERIALS BY ELECTROPLATING**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Date of last election
23.09.2002.

Referent publications of lecturer

1. A.Meštrović–Markovinović, A. Marijić. Elektrokemijski reaktor s tro-dimenzijskom elektrodom: III dio, Miješana konvekcija, Kem. Ind. 52 (2003) 45.
2. A. Meštrović–Markovinović. Elektrokemijski reaktor s tro-dimenzijskom elektrodom: II dio, Prirodna konvekcija, Kem. Ind. 52 (2003) 1.
3. A. Meštrović–Markovinović. T. Todorović. Elektrokemijski reaktor s tro-dimenzijskom elektrodom: I dio, Prisilna konvekcija, Kem. Ind. 51 (2002) 503.
4. Đ.Matić, E.Kovačević, A. Meštrović–Markovinović. Brza elektrokemijska depozicija kroma, Kem. ind., 41 (1992) 447.
5. A. Meštrović – Markovinović. Đ. Matić. Mass transfer to a rotating horizontal cylinder electrode with full and partial immersion, J.Appl.Electrochem. 14 (1984) 675.

Lecturer data	
Surname, Name	**PhD. Ingrid Milošev, full professor**
E-mail adress	
Course	**5.3. BIOMEDICAL IMPLANT MATERIALS**
Institution	Institut «Jožef Štefan», Ljubljana, Slovenia

Curriculum vitae

Education 1994-1995 - postdoctoral fellowship at the J. Stefan Institute, Slovenia and Heinrich-Heine University of Düsseldorf, Germany; 1993 - Ph.D. in Chemistry, Faculty of Chemistry and Chemical Technology, University of Ljubljana *"Corrosion Behaviour of Hard Nitride Coatings Based on Cr and Ti",* supervisors Prof.Dr. M. Metikoš-Huković and Prof.Dr. S. Pejovnik; 1991 - M.Sc. in Chemistry, Faculty of Chemistry and Chemical Technology, University of Ljubljana *"Electrochemical Properties of 90Cu-10Ni Alloy in Alkaline Solutions; Passivation and Corrosion",* supervisors Prof.Dr. M. Metikoš-Huković and Prof.Dr. S. Pejovnik; 1986 - Diploma work, Faculty of Chemical Engineering and Technology, University of Zagreb *"The Mechanism of Formation of Thin Cu_xO i Cu_xS Films on Copper",* supervisor Prof.Dr. M. Metikoš-Huković; 1981 - 1985 - study of chemical technology at the Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia

Professional experience

2004 – senior research associate at the Faculty of Chemistry and Chemical Engineering

2001- senior research associate at the Jožef Stefan Institute

2001- employed at the Orthopaedic Hospital Valdoltra as assistant general manager for research and education (part time job, in addition to full time job at the Jožef Stefan Institute)

1997- research associate at the Faculty of Chemistry and Chemical Engineering

1997- 2001 research associate at the Jožef Stefan Institute

1994-1997 - postdoctoral associate

1987-1993 – Ph.D. student

1987- employed at the J. Stefan Institute

Research scientific studies abroad:

1991 (3 months) - Department of Chemistry, University of Sherbrooke, Canada, supervisor Dr. M. Drogowska

1992 –2002 (altogether 20 months) Institut für Physikalische Chemie und Elektrochemie, Heinrich-Heine Universität Düsseldorf, Germany, supervisor Prof.Dr. H.-H. Strehblow

Bibliography: 34 original papers in international peer-review journals; 16 original papers in domestic peer-review journals; 32 contributions at domestic and international conferences; 5 lectures at universities abroad; 316 citations according to the Web of Science database

Date of last election

Referent publications of lecturer

1. I. Milošev, M. Metikoš-Huković, H.-H. Strehblow. Passive film on orthopaedic TiAlV alloy formed in physiological solution investigated by X-ray photoelectron spectroscopy. Biomaterials, 21 (2000) 2103-2113.
2. I. Milošev, H.-H. Strehblow. The behavior of stainless steels in physiological solution containing complexing agent studied by X-ray photoelectron spectroscopy. Journal of Biomedical Materials Research 52 (2000) 404-412.
3. I. Milošev, V. Antolič, A. Minovič, A. Cör, S. Herman, V. Pavlovčič, P. Campbell. Extensive metallosis and necrosis in failed prostheses with cemented titanium-alloy stems and ceramic heads. Journal of Joint and Bone Surgery, 82-B (2000) 352-357.
4. I. Milošev. Effect of complexing agents on the electrochemical behaviour of orthopaedic stainless steel in physiological solution. Journal of Applied Electrochemistry 32 (2002) 311-320.
5. I. Milošev, H.-H. Strehblow. The composition of the passive film formed on CoCrMo alloy in simulated physiological solution. Electrochimica Acta 48 (2003) 2767-2774.

Lecturer data
Surname, Name **PhD. Mira Ristić**
E-mail adress
Course **5.5. NANOSTRUCTURED METAL OXIDES - SYNTHESIS AND APPLICATIONS**
Institution Ruder Boskovic Institute, Zagreb

Curriculum vitae

Mira Ristić received the Ph. D. degree from the Ruđer Bošković Institute, University of Zagreb with the title of Ph. D. thesis: *"Chemical and structural properties of systems Fe_2O_3-Me_2O_3, M = Ga, In, Eu, Gd"*, field of Physical Chemistry. She took Ms. Sc. degree at Faculty of Science, University of Zagreb, 1988. working on adsorption/desorption equilibria of inorganic ions at iron (hydro)oxides/water solutions interface under the supervision of Prof. Svetozar Musić. She has been working at Ruđer Bošković Institute since 1985. She has scientific colaboration with the School of Dentistry, University of Zagreb as well as the Hebrew University Jerusalem, Israel. (Professors: I. Nowik and I. Felnerom). She has published 45 papers in the journals cited in *Current Contents*.
Research interests: Chemical and structural properties of ferrites, Synthesis and characterization of nanosized metal oxides.

Date of last election

Referent publications of lecturer

1. M. Ristić, M. Ivanda, S. Popović, S. Musić. Dependence of nanocrystalline SnO_2 particle size on synthesis route, *J. Non-Crystalline Solids*, 303 (2002) 270.
2. B. Gržeta, M. Ristić, I. Nowik, S. Musić. Formation of nanocrystalline magnetite by thermal decomposition of iron choline citrate, *J. Alloys & Comp*. 334 (2002) 304.
3. M. Ristić, I. Nowik, S. Popović, I. Felner, S. Musić. Influence of synthesis procedure on YIG formation, *Mater. Lett.* 57 (2003) 2584.
4. M. Ristić, S. Popović, S. Musić. Sol-gel synthesis and characterization of Nb_2O_5 powders, *Mater. Letters*, 58 (2004) 2658.
5. M. Ristić, S. Popović, S. Musić. Application of sol-gel metehod in the synthesis of gallium(III)-oxide, *Mater. Letters*, (2005)

Lecturer data
Surname, Name **PhD. Marijan Gotić**
E-mail adress
Course **5.5. NANOSTRUCTURED METAL OXIDES - SYNTHESIS AND APPLICATIONS**
Institution Ruder Boskovic Institute, Zagreb

Curriculum vitae

Marijan Gotić received the Ph. D. degree from the Ruđer Bošković Institute, University of Zagreb with the title of Ph. D. thesis: "Mössbauer spectroscopy of iron hydroxides, oxyhydroxides and oxides" and a master's degree ("Influence of iron on the structural properties of Zn-borosilicate and Pb-metaphosphate glasses") he got in 1989. at Faculty of Science, University of Zagreb., both under the supervision of Professor Svetozar Musić. He has been working at Ruđer Bošković Institute since 1985. He has published 25 *Current Contents* publications.
Research interests: microstructural properties of transition metal oxides depending on synthesis conditions. Influence of nanosized metal oxide particles on the cancer cells growth

Referent publications of lecturer

1. M. Gotić, M. Ivanda, A. Sekulić, S. Musić, S. Popović, A. Turković, K. Furić. Microstructure of nanosized TiO_2 obtained by sol-gel synthesis, Mater. lett. 28 (1996) 225.
2. M. Gotić, M. Ivanda, S. Popović, S. Musić, A. Sekulić, A. Turković, K. Furić. Raman investigation of nanosized TiO_2. J. Raman. Spectr. 28 (1997) 555.
3. M. Gotić, S. Popović, M. Ivanda, S. Musić, Sol-gel synthesis and characterization of V_2O_5 powders, Mater. Letters, 578 (2003) 3186.
4. S. Ivanković, M. Gotić, M. Jurin, S. Musić, Photokilling squamons carcinoma cells SCCVII with ultrafine particles of selected metal oxides, J. Sol-Gel Science & Technology, 27 (2003) 225.
5. N. Šijaković-Vujičić, M. Gotić, S. Musić, M. Ivanda, S. Popović. Synthesis and microstructural properties of Fe-TiO2 nanocrystalline particles obtained by a modified sol-gel method. J. Sol-Gel Sci. Technol. 30 (2004) 5.

Lecturer data
Surname, Name **PhD. Antun Drašner**
E-mail adress
Course **5.6. METAL HYDRIDES AND HYDROGEN ECONOMY**
Institution Ruder Boskovic Institute, Zagreb

Curriculum vitae

Antun Drašner was born in Kutina 1955. g. Bachelor degree 1979, Faculty of Science, Master of Science degree 1985, The University of Zagreb, Ph. D. 1991, Ruđer Bošković Institute with thesis «Interaction of hydrogen and $ZrCr_2$-based intermetallic compounds». Since 1998 he has worked as Research Associate in Laboratory for solid state chemistry, Division of Materials Chemistry, Ruđer Bošković Institute, on scientific project «Intermetallic compounds and metallic hydride». Publications: 30 scientific papers cited by CC and 3 professional papers. Main research activities: crystallography, solid state chemistry, intermetallic and interstitial compounds, hydrogen and metallic hydride. Member of the Croatian Chemical Society and Croatian Crystallographic Association.
E-mail: drasner@rudjer.irb.hr , Phone: 385-1-456-1111, Ruđer Bošković Institute

Date of last election

Referent publications of lecturer

1. A. Drašner, Ž. Blažina. Hydrogen sorption properties of the $LaNi_{5-x}$ Ga_x alloys, J. Alloys Comp. 359 (2003) 180-185.
2. B. Šorgić, A. Drašner, Ž. Blažina. Structural and hydrogen sorption properties of $RENi_{5-x}$ Al_x (RE=Gd, Tb, Dy, Ho, Er and Y) alloys, J. Alloys Comp. 356(2003)501-504.
3. G. Miletić, B. Šorgić, A. Drašner, Ž. Blažina. Crystal structure and hydride formation of the $HoNi_{5-x}$ Ga_x alloys, J. Mater. Sci. Lett. 20 (2001) 1217-1219.
4. Ž. Blažina, B. Šorgić, A. Drašner. Crystal structure, thermal expansion and hydrogen sorption properties $GdNi_{5-x}$ Ga_x alloys, J. Phys.: - Condens. Matter.11 (1999) 3105-3114.
5. B. Šorgić, Ž. Blažina, A. Drašner. The $RENi_4$ Ga (RE = Dy, Ho, Er) intermetallic compounds - Crystal structure and hydride properties, Croat. Chem. Acta 72 (1999) 567-574.

Lecturer data	
Surname, Name	**PhD. Ante Jukić, asisstant professor**
E-mail adress	ajukic@fkit.hr
Course	**5.7. FUEL CELLS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Ante Jukić was born in Vukovar, Croatia, in 1971. He graduated 1997. with excellent grade at Faculty of chemical engineering and technology, University of Zagreb, and 1998. he joined the same Faculty as a research assistant. He received M. Sc. degree in 2001. for work Kinetics and mechanism of the electrochemical H2 evolution reaction on the Ni (Co) / Zr metallic glasses and Ph. D. in chemical engineering 2004. for work Optimization of manufacturing process and properties of lubricating mineral oil polymeric additives from University of Zagreb. As a coauthor he published 22. scientific papers in journals, books and conference proceedings, and participate in making out five expertise elaborates. In addition, he attained 20. domestic and international meetings (five oral lectures, two invited). From July 2003. to October 2003. he was doing scientific training at Max Planck Institute in Mainz, Germany. His scientific work was awarded with the University Dean award (1997.), Society of university teachers and other scientists in Zagreb award (2001.) and Croatian Academy of Engineering award (2004.).

Date of last election
5.11.2001.

Referent publications of lecturer

1. Jukić, Ante; Metikoš-Huković, Mirjana. The hydrogen evolution reaction on pure and polypyrrole coated GdNi4Al electrodes. // Electrochimica Acta. 48 (2003) 3929-3937.
2. Jukić, Ante; Piljac, Jasenka; Metikoš-Huković, Mirjana. Electrocatalytic behavior of the Co_33 Zr_67 metallic glass for hydrogen evolution. // Journal of Molecular Catalysis A: Chemical. 166 (2001) 267-276.
3. Metikoš-Huković, Mirjana; Jukić, Ante. Correlation of electronic structure and catalytic activity of Zr-Ni amorphous alloys for the hydrogen evolution reaction. // Electrochimica Acta. 45 (2000) 4159-4170.
4. Jukić, Ante; Metikoš-Huković, Mirjana. Electrolytic hydrogen evolution kinetics: Relation to the electronic properties of the Zr-Ni metallic glasses // Hydrogen at surfaces and interfaces / Jerkiewicz, G. ; Feliu, J.M. ; Popov, B.N. (ur.). Toronto : Electrochemical Society, 2000.
5. Jukić, Ante; Metikoš-Huković, Mirjana. Electrocatalytic behaviour of Ni-Zr metallic glasses as hydrogen electrodes // 3rd International Symposium on Electrocatalysis: Advances & Industrial Applications / Hočevar, S. ; Gaberšček, M. ; Pintar, A. (ur.). Ljubljana : National Institute of Chemistry, 1999.
6. Jukić, Ante; Metikoš-Huković, Mirjana. Hydrogen evolution reaction on Ni-alloys stabilized by H-adsorption // Molecular functions of electroactive thin films, / Oyama, N.; Birss, V.I. (ur.). Boston : Electrochemical Society, 1998.

Lecturer data	
Surname, Name	**PhD. Laszlo Sipos , full professor**
E-mail adress	lsipos@fkit.hr
Course	**5.8. COMPUTERIZED EXPERIMENTS**
Institution	Faculty of Chemical Engineering and Technology, Zagreb

Curriculum vitae

Laszlo Sipos was born in 1943 in Bečej. Received BSc 1967, MSc 1970 and PhD 1974 at the University of Zagreb. Began his work at the Center for Marine Research, Institute "Ruđer Bošković" in Zagreb (1967-1982). Subsequently, he worked at the Faculty of Civil Engineering University of Zagreb (1982-1988). Since 1988 he is professor of General and Inorganic Chemistry at the Faculty of Chemical Engineering and Technology University of Zagreb. He was on leave for ten months (1969/70) at the University of Warsaw, Poland, and three years (1975-1978), at the Nuclear Research Center (KFA) in Jülich, F.R. Germany. His scientific interest is study of electrochemical redox processes, development and application of electroanalytical techniques for determination and characterization of trace metals in aquatic environment as well as development, scale up and application of water treatment processes.

Date of last election
14.09.2004.

Referent publications of lecturer

1. P. Valenta, L. Sipos, I. Kramert, P. Krumpen, H. Rutzel, "An Automatic Voltammetric Analyzer for the Simultaneous Determination of Toxic Trace Metals in Water", Fresenius Z. Anal. Chem. 312 (1982) 101-108.
2. Z. Grabarić, D. Iveković, L. Sipos, B. Grabarić, "Improved Signals Ratio Resolution Method by Optimization of Resolution Function - Simultaneous Determination of Cu(II) and Cd(II) in Water Samples", Journal of AOAC International, 82 (1999)1185-1196.
3. M. Vuković, Ž. Filipović-Kovačević, N. Ribičić, L. Sipos, “Determination of arsenic in water samples treated with ozone”, J. Environ. Sci. Heal. Part A, 39 (2004) 1979-1988.

II. 4. 5. Contractual relationships among the students and the faculty in charge of the doctoral study

Teaching and the elaboration of the doctor's thesis takes place at the Faculty of Chemical Engineering and Technology. Students are obliged by the contract to refund the financial means for performing the teaching, for the research work and the defending the doctor's thesis.

II.4.7. The list of teaching places

See the item II.4.2.

II.4.8. Optimal number of students

Optimal number of students concerning the space, equipment and number of lecturers is between 30 and 50 maximal.

II. 4.9. Costs evaluation of the doctoral Study

The cost for studing the doctoral program is 42.000,00 kn total.

II. 4.10. Financing of the doctoral study

The doctoral programs are financed exclusively by the school fee of the students. They either pay by themselves or they get paid by the institution in which they work. If the students are junior researchers, the school fee is partly refunded by the Ministry of science, education and sports with the support of scientific projects, which they are scientific active on.

II. 4.11. Quality of the doctoral study

During the study the students evaluate the quality and the successfulness of the doctoral study via students' anonymous polls. In the same way, by means of polls, they monitor the improving of the doctoral study and the Faculty only performs the evaluation process of the mentioned study.