

Opasraportti

Courses in English for Exchange Students: Chemistry (2016 - 2017)

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

781650S: Atomic Spectrometric Techniques, 5 op
782640S: Chemistry of Hydrometallurgical Processes, 5 op
782639S: Electrochemistry, 5 op
781648S: Inorganic Structural Chemistry, 5 op
780601S: Project work, 12 op
781649S: Sampling and Sample Pretreatment, 5 op
781652S: Solid State Chemistry, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

781650S: Atomic Spectrometric Techniques, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish. English on demand.

Timing:

4th or 5th spring. The course is lectured every other year, next time during the spring 2017.

Learning outcomes:

Upon completion of the course, student should have acquired knowledge and understanding of AAS (especially ETAAS) and plasma based techniques (ICP-OES, ICP-MS), their theoretical background and modern

instrumentation. Student is also able to describe the advantages and “weak points” of the techniques in the point of view of elements and samples to be analyzed. In addition, knowledge is acquired on the optimization of measurement procedures and interference effects and their elimination.

Contents:

Origin of atomic absorption, atomic emission and atomic mass spectra. Instrument components and their properties, optimization of the determination procedures (incl. interference effects and their correction), and instrument diagnostics. Special sample introduction techniques and hyphenated techniques.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

30 hours of lectures and seminars + 103 hours of self-study incl. practical project work

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Instrumental Analysis (780328A or 781308A)

Recommended optional programme components:

Previous 781637S Atomispektrometric Methods 4 credits and 781638S ICP-MS Workshop 3 credits

Recommended or required reading:

Lajunen, L.H.J. and Perämäki, P.: Spectrochemical Analysis by Atomic Absorption and Emission, 2 nd ed., The Royal Society of Chemistry, 2004

Assessment methods and criteria:

Final examination or home assignment. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Paavo Perämäki

Working life cooperation:

No

Other information:

No

782640S: Chemistry of Hydrometallurgical Processes, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish, English on demand

Timing:

4th or 5th spring. The course is lectured every other year, next time during the spring 2017.

Learning outcomes:

Upon completion of the course, the student will be able to explain chemical principles of hydrometallurgical processes and phenomena. The student knows the most important chemical reactions and variables affecting hydrometallurgical processes. Process chemistry is significant in several industrial applications, and those applications are considered during the course.

Contents:

Introduction to hydrometallurgical processes, pre-treatment of concentrates (oxidation, heat treatment), principles of dissolution (including leaching and bioleaching) and purification, chemical precipitation and other metals recovery processes (extraction, ion-exchange), electrical processes and process chemistry (electrolysis, corrosion).

Mode of delivery:

Face-to-face teaching and seminars

Learning activities and teaching methods:

40 hours of lectures, 10 hours of seminars, 84 hours of self study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Physical Chemistry I and Physical Chemistry II

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes (in English).

Assessment methods and criteria:

Final examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Ulla Lassi

Working life cooperation:

No

Other information:

No

782639S: Electrochemistry, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish/English on demand

Timing:

4th or 5th autumn. The course is lectured every other year, next time during the autumn 2018.

Learning outcomes:

Upon completion of the course, the student will be able to explain the essential phenomena of electrochemistry, such as electrochemical reactions, electrolytes and related thermodynamics. The student knows the principle of electrochemical cells (batteries and fuel cells) and kinetics of electrochemical reactions. These phenomena are significant in chemical and metal industry, such as in metal recovery by electrolysis.

Contents:

Introduction to electrochemistry, electrochemical reactions and reaction kinetics, electrolytes and thermodynamics of electrolytic solutions, electrochemical cells (batteries and fuel cells), measurement methods of electrochemical properties, applications of electrochemistry.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

50 hours of lectures, 84 hours of self study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Physical Chemistry I and Physical Chemistry II

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Murtomäki, L., Kallio, T., Lahtinen, R. & Kontturi, K.: Sähkökemia, 2. painos, Korpiljyvä Oy, Jyväskylä, 2010; Bockris, J.O'M., Reddy, A.K.N.: Modern Electrochemistry, vol 1, 2. painos, Plenum Press, New York, 1988, partly, lecture notes. Examination based on the lectures.

Assessment methods and criteria:

Final examination

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Ulla Lassi

Working life cooperation:

No

Other information:

No

781648S: Inorganic Structural Chemistry, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish/English on demand

Timing:

4th spring. The course is lectured every other year, next time during the spring 2017.

Learning outcomes:

After this course the student is familiar with molecular symmetry and application of molecular symmetry in vibration spectroscopy, electronic absorption spectroscopy and in multinuclear NMR spectroscopy.

Contents:

Molecular symmetry and group theory, vibrational spectroscopy, electronic absorption spectroscopy and NMR spectroscopy.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

34 hours of lectures, 8 hours of exercises, 92 hours of self-study.

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Inorganic Chemistry I (780353A or 781301A) and Inorganic Chemistry II (780391,781302A, or 781642S)

Recommended optional programme components:

Previous course 781639S Molecular Symmetry and Spectroscopy 5 cr. Contains also parts of the previous course 781614S Structural Methods in Inorganic Chemistry 3 cr.

Recommended or required reading:

Rankin, D. W. H., Mitzel, N, W, ja Morrison, C. A., Structural Methods in Molecular Inorganic Chemistry, John Wiley & Sons, Ltd., Chichester, 2013.

Assessment methods and criteria:

The assessment of the course is based on the final examination. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Doc. Raija Oilunkaniemi

Working life cooperation:

No

Other information:

No

780601S: Project work, 12 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

10 credits/200 hours of work

Language of instruction:

Finnish/English on demand

Timing:

4th autumn-spring

Learning outcomes:

After the laboratory project the student knows a research work and methods of his/her field and has readiness to perform the Pro Gradu Thesis.

Contents:

Laboratory work and written report

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

200 hours of work including laboratory research and a report.

Target group:

Chemistry, compulsory

Prerequisites and co-requisites:

B.Sc. studies in chemistry including the course Research Training (780301A) completed

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Material given by teachers

Assessment methods and criteria:

Laboratory research and a report

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

Professors, Docents, Lectures and Doctor level Researchers of the Chemistry Department.

Working life cooperation:

No

Other information:

The Project work including the report is to be done within six months from starting the work

781649S: Sampling and Sample Pretreatment, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish. English on demand.

Timing:

4th or 5th spring. The course is lectured every other year, next time during the spring 2017.

Learning outcomes:

After this course student becomes aware of the importance of correct sampling (especially heterogeneous solid materials). The student also gets knowledge how to i) sample and ii) prepare samples for various types of analysis: determination of total element concentrations (incl. ultra trace levels), fractionation of elements and

element speciation analysis. At the end of the course the students should have also acquired an understanding of the techniques that are used in sample preconcentration and matrix separation, as well as purification of reagents and laboratory tools when very low element concentrations are measured.

Contents:

Representative sampling and sampling errors, various sample preparation techniques utilizing open and closed systems and their use in the determination of total element concentrations in inorganic and organic sample types. Fusion techniques and fire assay methods. Sample preparation in trace element fractionation and speciation analysis. Systematic errors in analysis (losses and contamination), clean rooms, separation and preconcentration techniques.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

30 hours of lectures + seminar presentation + 103 hours of self-study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Introduction to Analytical Chemistry (780111P or 780119P)

Recommended optional programme components:

Previous courses 781640S Sampling and Sample Preparation 4 cr and 781632S Determination of Trace Elements 3 cr combined.

Recommended or required reading:

Sirén, H., Perämäki, P., Laiho, J.: Esikäsittelyn käsikirja, Kemian Kustannus Oy, 2009 and material handed out by the lecturer.

Assessment methods and criteria:

Final examination or home assignment. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Paavo Perämäki

Working life cooperation:

No

Other information:

No

781652S: Solid State Chemistry, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 credits /134 hours of work

Language of instruction:

Finnish/English on demand

Timing:

4th or 5th autumn. The course is lectured every other year, next time during the autumn 2016.

Learning outcomes:

Knowledge of synthesis, structures, spectroscopic properties, reactions, and applications of solid materials.

Contents:

Preparation of solid materials, structures of solids, crystal defects, thermodynamics and reaction kinetics, the effect of external conditions on some reactions, phase diagrams and their applications, optical, magnetic and electric properties of solid materials, and industrial applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

32 hours of lectures, 102 hours of self-study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

Physical Chemistry I (780347A or 781303A), Inorganic Chemistry I (780353A or 781301A), and Inorganic Chemistry II (780391A or 781302A)

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

West, A.R.: Solid State Chemistry and its Applications, 2nd Ed., John Wiley & Sons, Chichester, 2014

Assessment methods and criteria:

The assessment of the course is based on the final examination. Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:

Prof. Risto Laitinen

Working life cooperation:

No

Other information:

No