Opasraportti


Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

783633S: Adhesion Chemistry, 3 op
781625S: Aquatic Chemistry, 4 op
782626S: Atmospheric Chemistry, 3 - 4 op
781637S: Atomic Spectrometric Methods, 4 op
780109P: Basic Principles in Chemistry, 4 op
780372A: Basic Principles of Green Chemistry, 4 op
782625S: Basic Principles of Quantum Chemistry, 3 - 4 op
784634S: Biological Mass Spectrometry, 4 op
784637S: Biological NMR Spectroscopy, 3 op
784635S: Capillary Techniques in Organic and Bioanalysis, 4 op
782621S: Catalysis, 3 op
782627S: Chemical Applications in Hazardous Waste Management and Environmental Technology, 4 op
780321A: Chemical Legislation in Finland, 1 op
780395A: Chemistry for Teachers, 4 op
782634S: Chemistry in industrial applications, 3 op
781610S: Chemistry of Metal Complexes, 3 op
783627S: Chemistry of Natural Substances I, 3 op
783641S: Chemistry of Natural Substances II, 3 op
781621S: Chemistry of Non-Metals, 3 op
783635S: Chemistry of Paints and Surface Coatings, 3 op
781613S: Chemistry of Rare Earth Elements, 3 op
781645S: Chemistry of Solid Fuels Ashes, 3 op
781644S: Computational Inorganic Chemistry, 3 op
784626S: Computer Analysis of NMR Spectra, 2 op
780396A: Demonstrations in Physics and Chemistry, 2 op
781632S: Determination of Trace Elements, 3 op
780373A: Environmental Chemistry, 3 op
781633S: Experimental Design, 4 op
781600S: Final Examination in Inorganic Chemistry, 7 op
783600S: Final Examination in Organic Chemistry, 7 op
782600S: Final Examination in Physical Chemistry, 7 op
784600S: Final Examination in Structural Chemistry, 7 op
782618S: High Pressure Kinetics, 3 op
781638S: ICP-MS Workshop, 3 op
780341A: Industrial Training I, 2 op
780342A: Industrial Training II, 4 op
780343A: Industrial Training III, 6 op
780344A: Industrial Training IV, 8 op
780353A: Inorganic Chemistry I, 6 op
781642S: Inorganic Chemistry II, 4 op
780378A: Inorganic Ion Reactions and Qualitative Analysis, 2 op
780328A: Instrumental Analysis, 4 - 5 op
782629S: Interactions between Molecules, 4 op
784627S: Interpretation of Mass Spectra and Workshop, 5 op
Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

783633S: Adhesion Chemistry, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
Opintokohteen oppi materiaali:
Skeits, I., 1990
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits
Timing:
4th or 5th period, autumn. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with basics in adhesion theory, surfaces treatment methods as well as common glue line strength testing methods. The student is also familiar with the most commonly used polymers in adhesives such as thermoplastic block rubbers, polyurethane- polyisocyanate adhesives, polyvinylacetate, polyvinylalcohol based adhesives, polyacrylates as adhesives, basic theory and polymer types used in anaerobic adhesives as well as with the chemistry of cyanoacrylates.
Contents:
Short introduction to adhesion theory, surfaces treatment methods and testing methods. The thermoplastic block rubbers, polyurethane adhesives, polyvinylacetate, polyvinylalcohol, polyacrylates, anaerobic adhesives and cyanoacrylates. Others: silicones, pressure adhesives (tapes).
Learning activities and teaching methods:
24 h lectures, one final examination.
Target group:
Chemistry.
Recommended or required reading:
Person responsible:
781625S: Aquatic Chemistry, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen oppimateriaali:
Stumm, Werner, 1996
Buffle, Jacques, 1988
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
Finnish.
Timing:
4th or 5th spring. The course is lectured every other year.
Learning outcomes:
After this course the student is familiar with aquatic chemistry of natural waters.
Contents:
Composition of natural waters, solubility equilibria, complex equilibria, oxidation-reduction equilibria, regulation mechanisms in natural waters, models of natural waters, a short survey on influences of pollution.
Learning activities and teaching methods:
32 h lectures, one final examination.
Target group:
Chemistry, optional.
Recommended or required reading:
Person responsible:
Lecturer Leena Kaila.

782626S: Atmospheric Chemistry, 3 - 4 op

Voimassaolo: 21.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laasonen Kari
Opintokohteen oppimateriaali:
Seinfeld, John H., 1998
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits
Timing:
4th period, autumn. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with the atmospheric chemistry.
Contents:
The course concentrates on atmospheric phenomena, especially the physics and chemistry that are related to atmospheric pollutions. Topics are: the chemical reaction on different parts of atmosphere (including ozone depletion), aerosoles, formation of small droplets and their impurities, acid rain and global warming.

**Learning activities and teaching methods:**
30 h lectures, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Prof. Kari Laasonen.

**Other information:**
Prerequisites: 780347A Physical Chemistry I and 782631S Physical Chemistry II or P.W. Atkins, Physical Chemistry, part 3.

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**781637S: Atomic Spectrometric Methods, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Paavo Perämäki

**Opintokohteen oppimateriaali:**
Lajunen, Lauri H. J., 2004

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 - 5.5 credits

**Language of instruction:**
Finnish.

**Timing:**
4th or 5th spring. The course is lectured every other year.

**Learning outcomes:**
After this course the student is familiar with a solid background theory of the various atomic spectrometric techniques as well as the current status of the modern instrumentation and analytical applications.

**Contents:**
Theoretical background for the different atomic spectrometric techniques (atomic absorption spectrometry and atomic emission spectrometry employing plasma sources), modern instrumentation and determination of various elements, interference effects and their correction, optimisation of the measurement procedures, instrument diagnostics.

**Learning activities and teaching methods:**
30 h lectures + seminar + practical exercise, one final examination.

**Target group:**
Chemistry, optional.

**Recommended or required reading:**

**Person responsible:**
Prof. Paavo Perämäki.

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**780109P: Basic Principles in Chemistry, 4 op**

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Minna Tiainen

**Opintokohteen oppimateriaali:**
Beata, Ralph H., 2002

*Opintokohteen kielet:* Finnish

**Leikkaavuudet:**

- 780372A Basic Principles of Green Chemistry, 4 op
- ay780355A Environmental Chemistry and Hazardous Wastes, 4.0 op
- 780360A Environmental Chemistry and Hazardous Wastes, 5.5 op
- 780375A Basic Principles of Green Chemistry, 2.0 op

**ECTS Credits:**
4 credits

**Language of instruction:**
Finnish

**Timing:**
1st autumn.

**Learning outcomes:**
After this course the student is familiar with basic chemistry phenomenon; equilibrium of acids and bases, chemical equilibrium, redox reactions and stoichiometry.

**Contents:**
Introduction to chemistry, stoichiometry, redox reactions, chemical equilibrium, the equilibrium of acid and bases, buffer solutions, titration.

**Learning activities and teaching methods:**
36 hours of lectures, one final examination.

**Target group:**
Biology, Geology, Mechanical Engineering, Process Engineering, compulsory.
Geography, optional.

**Recommended or required reading:**

**Person responsible:**
Lecturer Minna Tiainen.

**Other information:**
This course is only for students who have chemistry as a minor subject.

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**780372A: Basic Principles of Green Chemistry, 4 op**

*Opiskelumuoto:* Intermediate Studies

*Laji:* Course

*Vastuuysikkö:* Department of Chemistry

*Arvostelu:* 1 - 5, pass, fail

*Opettajat:* Toivo Kuokkanen, Minna Tiainen

*Opintokohteen oppimateriaali:*
Lancaster, Mike, 2002

*Opintokohteen kielet:* Finnish

**Leikkaavuudet:**

- 780355A Environmental Chemistry and Hazardous Wastes, 4.0 op
- 780360A Environmental Chemistry and Hazardous Wastes, 5.5 op
- 780375A Basic Principles of Green Chemistry, 2.0 op
ECTS Credits: 4 credits
Language of instruction: Finnish.
Timing: Spring.
Learning outcomes: After this course the student is familiar with the twelve principles of green chemistry.
Contents: Environmental friendly chemistry. The principles of green chemistry with examples of real life. Utilization, refining and disposal of environmentally hazardous wastes, hazardous wastes.
Learning activities and teaching methods: 37 h lectures, one final examination.
Target group: Chemistry.
Recommended optional programme components: Introduction to Physical Chemistry (780101P) and Introduction to Inorganic Chemistry (780102P) or Basic Principles in Chemistry (780109P).
Person responsible: Lecturer Minna Tiainen and Doc. Toivo Kuokkanen.

782625S: Basic Principles of Quantum Chemistry, 3 - 4 op
Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laasonen Kari
Opintokohteen oppimateriaali: Cramer, Christopher J., 2002
Opintokohteen kielet: Finnish
ECTS Credits: 3 - 4 credits
Timing: 4th period, autumn/spring. The advanced courses lectured every year varies year by year.
Learning outcomes: After this course the student is familiar with the modern quantum chemistry.
Contents: The emphasis is on the many-electron methods like Hartree-Fock, configuration method and density functional theory. This course focuses on the theoretical aspects whereas the practical aspects will be dealt in the course 781626S Molecular modelling workshop.
Learning activities and teaching methods: 30 h lectures, one final examination.
Target group: Chemistry.
Recommended optional programme components: -
Person responsible: Prof. Kari Laasonen.
Other information: Prerequisites: 782631S Physical Chemistry II.

784634S: Biological Mass Spectrometry, 4 op
ECTS Credits:
4 credits

Timing:
The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the mass spectrometric techniques used in the analysis and research of biological compounds. Applications in the research of peptides and proteins, glycoconjugates and nucleic acids will be presented.

Contents:
Instrumentation, LC/MS, new methods of ionisation, derivatives, the strategies of analysing peptides and proteins, methods for analysing glycoconjugates, nucleic acid derivatives.

Learning activities and teaching methods:
24 h lectures + 6 h exercises + demonstration, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:

Other information:

784637S: Biological NMR Spectroscopy, 3 op

ECTS Credits:
3 - 7 credits

Language of instruction:
English.

Timing:
The advanced courses lectured every year varies year by year.

Learning outcomes:
After the course the students are familiar with production of most common 2D, 3D and 4D double and triple resonance NMR spectra.

Contents:
During the course the students get hands on experience on setting up and acquiring multi dimensional spectra as well as processing and converting data to other formats and assigning protein backbones.

Learning activities and teaching methods:
14 h lectures + applications, 30 h exercises, one final examination.

Target group:
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Senior assistant Sampo Mattila.

**Other information:**

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**784635S: Capillary Techniques in Organic and Bioanalysis, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jalonen Jorma

**Opintokohteen oppimateriaali:**
Schomburg, Gerhard, , 1990
Weinberger, Roger, , 2000

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits

**Timing:**
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with the modern separation methods, which use capillary techniques. These methods include for instance capillary gas chromatography, capillary electrophoresis and capillary electrochromatography.

**Contents:**
Some applications in organic and bioanalysis will be presented.

**Learning activities and teaching methods:**
24 h lectures, demonstration, 6 h exercises, seminar or one final examination.

**Target group:**
Chemistry.

**Recommended optional programme components:**

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**Recommended or required reading:**

**Person responsible:**

**Other information:**
Prerequisites: 780111P Introduction to Analytical Chemistry and 780328A Instrumental Analysis.

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**782621S: Catalysis, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Pursiainen Jouni

**Opintokohteen oppimateriaali:**
Gates, Bruce C., , 1992

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 - 4 credits
Timing:
4th or 5th period, autumn. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the theory of catalysis. Thermodynamic and kinetic background will be studied, including mechanisms of the most important catalytic reactions. Applications, preparation, characterisation and structure of homogenous, heterogeneous and enzymatic catalysts will be discussed.

Contents:
Principles of catalysis, homogeneous catalysis in solutions, polymer catalysis, zeolites, heterogeneous catalysis on surfaces and bioinorganic catalysis.

Learning activities and teaching methods:
30 h lectures, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Assessment methods and criteria:
Examination based on the lectures.

Person responsible:
Prof. Jouni Pursiainen.

Other information:
Prerequisites: 782631S Physical Chemistry II.

782627S: Chemical Applications in Hazardous Waste Management and Environmental Technology, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Toivo Kuokkanen

Opintokohteen oppimateriaali:
Clark, J.H., , 1995

Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the theory and practice with chemical applications, especially new ones, in hazardous waste management and environmental technology.

Contents:
Principles and activities in hazardous waste management, new chemical methods and technologies in hazardous waste treatment, one practical work (alternative topics).

Learning activities and teaching methods:
30 h lectures + seminar + practical exercise, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Doc. Toivo Kuokkanen.

Other information:
Prerequisites: 780372A Basic Principles in Green Chemistry and 780347A Physical Chemistry I.

780321A: Chemical Legislation in Finland, 1 op

Opiskelumuoto: Intermediate Studies
ECTS Credits: 1 - 2 credits
Language of instruction: Finnish.
Timing: 3rd autumn.
Learning outcomes: After the course the student is familiar with Finnish legislation concerning chemistry and occupational health. He/she is acquainted with the limitations of the use of dangerous chemicals and is able to find updated information of them. The student is also familiar with the main laws of pressure containers and tanks of compressed gases as well as of radiation.
Contents: Safety at work, sanitarily and environmentally hazardous chemicals, explosive materials and combustible liquids, pressure containers and tanks of compressed gases.
Learning activities and teaching methods: 10 h lectures, one final examination.
Target group: Chemistry, compulsory.
Person responsible: Senior Laboratory Manager Pentti Oksman.

780395A: Chemistry for Teachers, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen kielet: Finnish
ECTS Credits: 4 credits

782634S: Chemistry in industrial applications, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Ulla Lassi
Opintokohteen kielet: Finnish
ECTS Credits:
3 credits

**Timing:**
4th or 5th period, spring.

**Learning outcomes:**
After this course the student is familiar with chemical applications in process and environmental technology. In particular, new applications of chemistry are considered.

**Contents:**
Catalytic applications in water purification, catalytic oxidation, preparation of biofuels from biomass, biomass gasification and the utilisation of biogas, chemistry and chemical reactions in mining processes etc. (visiting lecturers from the companies).

**Learning activities and teaching methods:**
30 h lectures, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**
Material given by the lecturer, scientific review papers.

**Assessment methods and criteria:**
Examination based on the lectures.

**Person responsible:**
Prof. Ulla Lassi.

**Other information:**
Prerequisites: Physical Chemistry I and II.

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**781610S: Chemistry of Metal Complexes, 3 op**

**Opiskelu穆oto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Leena Kaila

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 - 4 credits

**Language of instruction:**
Finnish.

**Timing:**
4th or 5th autumn. The course is lectured every other year.

**Learning outcomes:**
After this course the student is familiar with complex compounds and their solution equilibria.

**Contents:**
Determination and concepts of metal complexes, solution chemistry of complexes, principal methods of studying complex equilibria, mathematical treatment of data, and applications.

**Learning activities and teaching methods:**
20 h lectures, one final examination.

**Target group:**
Chemistry, optional.

**Recommended or required reading:**
Material handed out by the lecturer.

**Person responsible:**
Lecturer Leena Kaila.

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**783627S: Chemistry of Natural Substances I, 3 op**

**Opiskelu穆oto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail
ECTS Credits: 3 - 4 credits
Timing: 4th or 5th period, autumn or spring. The advanced courses lectured every year varies year by year.
Learning outcomes: After this course the student is familiar with carbohydrates and lipids, their chemistry and role in life science.
Contents: Carbohydrates and their reactions, primary and secondary metabolism, chemical formation of disaccharides, polysaccharides, chemical glycochemistry. Lipids, eicosanoids, phospholipids and their biosynthesis.
Learning activities and teaching methods: 20 h lectures, one final examination.
Target group: Chemistry.
Person responsible: Prof. Marja Lajunen.
Other information: Prerequisites: 780389A Organic Chemistry I and 783643S Organic Chemistry II.

783641S: Chemistry of Natural Substances II, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen
Opintokohteen oppimateriaali: Dewick, Paul M., 1997
Mann, J., Davidson, R.S., Hobbs, J.B., Banthorpe, D.V. ja Harborne, J.B., 1994
Opintokohteen kielet: Finnish
ECTS Credits: 3 - 4 credits
Timing: 4th or 5th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes: After this course the student is familiar with terpenoids, steroids, and alkaloids. He/she knows their biosynthetic background, properties and effects.
Contents: Terpenoids, steroids, and alkaloids.
Learning activities and teaching methods: 20 h lectures, one final examination.
Target group: Chemistry.
Person responsible: Prof. Marja Lajunen.
Other information:
Prerequisites: 780389A Organic Chemistry I and 783643S Organic Chemistry II.

781621S: Chemistry of Non-Metals, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Raija Oilunkaniemi
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits
Language of instruction:
Finnish or English.
Timing:
4th or 5th autumn. The course is lectured every other year.
Learning outcomes:
This course will give students an overview of the development of chemistry of non-metals by examining current literature of the field.
Contents:
New methods in the synthesis of non-metallic compounds, structural chemistry, and chemical properties of non-metallic compounds.
Learning activities and teaching methods:
18 h lectures + seminar, one final examination, attendance at the lectures.
Target group:
Chemistry, optional.
Recommended optional programme components:
Prerequisites: 780353A Inorganic Chemistry I.
Recommended or required reading:
Material handed out by the lecturer.
Person responsible:
Doc. Raija Oilunkaniemi.

783635S: Chemistry of Paints and Surface Coatings, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
Opintokohteen oppimateriaali:
Paul, Swaraj , , 1985
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits
Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with the basic principles of colour theory and the most important polymers used as binders in paints: alkyd paints and polyesters, surface coatings based on formaldehyde, siloxanes and other silicon polymers, epoxy polymers and acrylate polymers. The student is also familiar with the most important inorganic and organic pigments used in paints as well as new painting technologies such as water soluble and water dilutable polymers used in surface coatings, systems that harden by radiation and polymer systems that have a high dry solids content.
Contents:

**Learning activities and teaching methods:**
24 h lectures, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Prof. Osmo Hormi.

**Other information:**
Prerequisites: 780326A Introduction to Polymer Chemistry.

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**781613S: Chemistry of Rare Earth Elements, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Laitinen Risto

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 - 4 credits

**Language of instruction:**
Finnish or English.

**Timing:**
4th or 5th autumn. The course is lectured every other year.

**Learning outcomes:**
This course will give students an overview of the development of chemistry of rare earth elements.

**Contents:**
Occurrence, isolation, chemical properties and coordination chemistry of rare earth elements.

**Learning activities and teaching methods:**
18 h lectures, one final examination.

**Target group:**
Chemistry, optional.

**Recommended optional programme components:**
780353A Inorganic Chemistry I and 781642S Inorganic Chemistry II.

**Recommended or required reading:**
Material handed out by the lecturer.

**Person responsible:**
Doc. Raija Oilunkaniemi.

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**781645S: Chemistry of Solid Fuels Ashes, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Minna Tiainen

**Opintokohteen oppimateriaali:**
Raiko, R., Saastamoinen, J., Hupa, M. & Kurki-Suonio, I., 2002

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 credits
Language of instruction:
Finnish.
Timing:
4th or 5th autumn. The course is lectured every other year.
Learning outcomes:
After this course the student is familiar with solid fuels and the formation mechanisms of ashes as well as the combustion technologies and the ash-related problems occurring in boilers.
Contents:
Ash forming material in solid fuels, thermal behaviour of ash forming material and ashes, combustion technologies, slagging, fouling, corrosion, bed material agglomeration and main analytical methods for chemical characterisation of fuels, ashes.
Learning activities and teaching methods:
20 h lectures + seminar, one final examination.
Target group:
Chemistry, optional.
Recommended optional programme components:
780353A Inorganic Chemistry I.
Recommended or required reading:
Person responsible:
Lecturer Minna Tiainen.

781644S: Computational Inorganic Chemistry, 3 op

Opiskeluopas: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laitinen Risto
Opintokohteen kielet: Finnish

ETCS Credits:
3 credits
Language of instruction:
Finnish.
Timing:
4th or 5th year. The course is lectured every other year.
Learning outcomes:
After this course the student is familiar with review of computational methods in quantum inorganic chemistry.
Contents:
Review of computational methods in quantum chemistry (molecular mechanics, semiempirical methods, ab initio methods, DFT methods), basis sets, computation of molecular properties, transition states, spectroscopic properties. The application of the methods in inorganic chemistry will be illustrated by examples from current literature.
Learning activities and teaching methods:
28 h lectures, 14 h exercises.
Target group:
Chemistry, optional.
Recommended optional programme components:
780353A Inorganic Chemistry I, 781642S Inorganic Chemistry II and 782630S Quantum Chemistry.
Recommended or required reading:
Person responsible:
Prof. Risto Laitinen.

784626S: Computer Analysis of NMR Spectra, 2 op
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Mattila, Sampo Antero
Opintokohteen oppimateriaali:
Günther, Harald . , 1995
Opintokohteen kielet: Finnish

ECTS Credits:
2 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with computer aided NMR spectral processing and production, and assignment tools.

Contents:
The basic theory for analysing NMR spectra; the structure, function and use of simulating and iterating analysis programs.

Learning activities and teaching methods:
8 h lectures + 28 h exercises, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Senior assistant Sampo Mattila.

780396A: Demonstrations in Physics and Chemistry, 2 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen kielet: Finnish

Leikkaavuudet:
766309A Demonstrations in Physics and Chemistry 2.0 op

ECTS Credits:
2 credits

781632S: Determination of Trace Elements, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Paavo Perämäki
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits
Language of instruction:
Finnish.

**Timing:**
4th or 5th spring. The course is lectured every other year.

**Learning outcomes:**
After this course the student is familiar with special problems incoming in determination of ultra trace levels of various elements.

**Contents:**

**Learning activities and teaching methods:**
24 h lectures, one final examination.

**Target group:**
Chemistry, optional.

**Recommended optional programme components:**
780328A Instrumental Analysis.

**Recommended or required reading:**
Material handed out by the lecturer.

**Person responsible:**
Prof. Paavo Perämäki.

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**780373A: Environmental Chemistry, 3 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Minna Tiainen

**Opintokohteen oppimateriaali:**
VanLoon, Gary W., , 2000

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**
- 780359A Environmental Chemistry 4.0 op
- 780355A Environmental Chemistry and Hazardous Wastes 4.0 op
- 780316A Environmental Chemistry 2.0 op
- 780360A Environmental Chemistry and Hazardous Wastes 5.5 op

**ECTS Credits:**
3 - 4 credits

**Timing:**
3rd autumn.

**Learning outcomes:**
After this course the student is familiar with chemistry of atmosphere, hydrosphere and terrestrial environment.

**Contents:**
Fundamentals of environmental chemistry; chemistry of the soil, natural and waste waters and atmosphere, circulation of chemical compounds in the nature, chemical releases, environmentally toxic and other noxious compounds, environmental analytics and basics of physical measurements.

**Learning activities and teaching methods:**
30 h lectures, one final examination.

**Target group:**
Chemistry, compulsory.

**Recommended optional programme components:**
Introduction to Physical Chemistry (780101P) and Introduction to Inorganic Chemistry (780102P) or Basic Principles in Chemistry (780109P).

**Recommended or required reading:**

**Person responsible:**
Lecturer Minna Tiainen.
781633S: Experimental Design, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Paavo Perämäki
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
Finnish.
Timing:
4th or 5th spring. The course is lectured every other year.
Learning outcomes:
After this course the student understands the importance of experimental design and is familiar with the most common applications of computer aided statistical experimental design.
Contents:
Factorial designs, D-optimal designs, mixture designs and response surface methodology. Computer programmes are applied during the course in the design and analysis of the experiments.
Learning activities and teaching methods:
30 h lectures, practical exercise, one final examination.
Target group:
Chemistry, optional.
Recommended optional programme components:
781631S Statistical Methods in Analytical Chemistry.
Recommended or required reading:
Person responsible:
Prof. Paavo Perämäki.

781600S: Final Examination in Inorganic Chemistry, 7 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Cotton, F. Albert, 1995
Huheey, James E., 1993
Opintokohteen kielet: Finnish

ECTS Credits:
7 - 7,5 credits
Timing:
4th or 5th period.
Target group:
Chemistry.
Recommended or required reading:
Assessment methods and criteria:
Texts for the final examination in the chosen subject in chemistry are given by the professor of the field. The final examination may be an oral and/or written examination. There are two teachers present in the oral examinations. The grade of the Final Examination may be improved by taking the examination again.

**Person responsible:**
Prof.

### 783600S: Final Examination in Organic Chemistry, 7 op

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen oppimateriaali:  
Cotton, F. Albert , , 1995  
Opintokohteen kielet: Finnish

ECTS Credits:  
7 - 7,5 credits  
Timing:  
4th or 5th period.  
Target group:  
Chemistry.  
Recommended or required reading:  
Assessment methods and criteria:  
Texts for the final examination in the chosen subject in chemistry are given by the professor of the field. The final examination may be an oral and/or written examination. There are two teachers present in the oral examinations. The grade of the Final Examination may be improved by taking the examination again.  
Person responsible:  
Prof.

### 782600S: Final Examination in Physical Chemistry, 7 op

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen oppimateriaali:  
Cotton, F. Albert , , 1995  
Opintokohteen kielet: Finnish

ECTS Credits:  
7 - 7,5 credits  
Timing:  
4th or 5th period.  
Target group:  
Chemistry.  
Recommended or required reading:  
Physical Chemistry: by separate agreement.  
Assessment methods and criteria:  
Texts for the final examination in the chosen subject in chemistry are given by the professor of the field. The final examination may be an oral and/or written examination. There are two teachers present in the oral examinations. The grade of the Final Examination may be improved by taking the examination again.  
Person responsible:  
Prof.
784600S: Final Examination in Structural Chemistry, 7 op

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen oppimateriaali:  
Cotton, F. Albert , 1995  
Opintokohteen kielet: Finnish  

ECTS Credits:  
7 - 7,5 credits  
Timing:  
4th or 5th period.  
Target group:  
Chemistry.  
Recommended or required reading:  
Structural Chemistry: by separate agreement.  
Assessment methods and criteria:  
Texts for the final examination in the chosen subject in chemistry are given by the professor of the field. The final examination may be an oral and/or written examination. There are two teachers present in the oral examinations. The grade of the Final Examination may be improved by taking the examination again.  
Person responsible:  
Prof.

782618S: High Pressure Kinetics, 3 op

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Toivo Kuokkanen  
Opintokohteen oppimateriaali:  
Porter G., 1970  
Van Eldik, R., 1986  
Reichardt, Christian , 2003  
Opintokohteen kielet: Finnish  

ECTS Credits:  
3 - 4 credits  
Timing:  
4th or 5th period. The advanced courses lectured every year varies year by year.  
Learning outcomes:  
After this course the student is familiar with the effect of high pressure on reactions of a different type.  
Contents:  
Chemical applications of high pressure, determination and calculation of activation volumes, pressure effect on activation volumes of different reaction classes, reaction kinetics by UV/Vis spectrometric methods.  
Learning activities and teaching methods:  
20 h lectures + two home works, one final examination.  
Target group:  
Chemistry.  
Recommended or required reading:  
Person responsible:
**781638S: ICP-MS Workshop, 3 op**

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Paavo Perämäki  
Opintokohteen kielet: Finnish  

ECTS Credits:  
3 - 4 credits  
Language of instruction:  
Finnish.  
Timing:  
4th or 5th spring. The course is lectured every other year.  
Learning outcomes:  
After this course the student is familiar with modern (quadrupole) ICP-MS devices and knows the advantages and limitations of the ICP-MS technique.  
Contents:  
Inductively coupled plasmas as ion sources, properties of modern ICP-MS instruments, matrix and other interference effects, laser ablation and other special techniques.  
Learning activities and teaching methods:  
20 h lectures and demonstrations, and practical exercise, one final examination.  
Target group:  
Chemistry, optional.  
Recommended or required reading:  
Material handed out by lecturer.  
Person responsible:  
Prof. Paavo Perämäki.

**780341A: Industrial Training I, 2 op**

Opiskelumuoto: Intermediate Studies  
Laji: Practical training  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish  

ECTS Credits:  
2 credits  
Learning activities and teaching methods:  
2nd or 3rd year.  
Target group:  
Chemistry, optional.

**780342A: Industrial Training II, 4 op**

Opiskelumuoto: Intermediate Studies  
Laji: Practical training  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish
ECTS Credits: 4 credits
Learning activities and teaching methods: 2nd or 3rd year.
Target group: Chemistry, compulsory.

780343A: Industrial Training III, 6 op
Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits: 6 credits
Learning activities and teaching methods: 2nd or 3rd period.
Target group: Chemistry, compulsory.

780344A: Industrial Training IV, 8 op
Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits: 8 credits
Learning activities and teaching methods: 2nd or 3rd period.
Target group: Chemistry, compulsory.

780353A: Inorganic Chemistry I, 6 op
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish
Leikkaavuudet: 780356A Inorganic Chemistry 9.0 op
Voitaa suorittaa useasti: Kyllä

ECTS Credits: 5.5 - 6 credits
Language of instruction: Finnish.
Timing:
2nd spring.

Learning outcomes:
After this course the student is familiar with most important basic principles of modern inorganic chemistry.

Contents:
Atomic structure, chemical bond and molecular structure, solid state chemistry, acid-base theories, oxidation-reduction reactions, overview of main group chemistry.

Learning activities and teaching methods:
40 h lectures + 16 h exercises, (8 home assignments), one final examination.

Target group:
Chemistry, compulsory.

Recommended optional programme components:
780101P Introduction to Physical Chemistry and 780102P Introduction to Inorganic Chemistry or 780109P Basic Principles in Chemistry.

Recommended or required reading:

Person responsible:
Prof. Risto Laitinen.

781642S: Inorganic Chemistry II, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish
Leikkaavuudet:
780391A Inorganic Chemistry II 4.0 op
780361A Inorganic Chemistry II 4.0 op

ECTS Credits:
4 credits

Language of instruction:
Finnish.

Timing:
4th autumn.

Learning outcomes:
After this course the student is familiar with basic concepts of coordination chemistry of transition metal complexes.

Contents:
Structure and bonding of complexes of transition metals and their chemical and spectroscopic properties, organometallic chemistry, catalysis, introduction to bioinorganic chemistry.

Learning activities and teaching methods:
22 h lectures + 16 h exercises, (8 home assignments), one final examination.

Target group:
Chemistry, compulsory.

Recommended optional programme components:
780353A Inorganic Chemistry I.

Recommended or required reading:

Person responsible:
Prof. Risto Laitinen.

780378A: Inorganic Ion Reactions and Qualitative Analysis, 2 op
**Opiskelumuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opintokohteen kielet:** Finnish

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**ECTS Credits:**  
2 credits

**Contents:**  
Introduction to inorganic ion reactions.

**Learning activities and teaching methods:**  
45 h laboratory works, 10 h work reports + final examination.

**Target group:**  
Subject teachers in Physical Sciences and Mathematical Sciences.

**Grading:**  
75 % laboratory work 25 % final examination.

**Person responsible:**  
Lecturer Minna Tiainen.

**Other information:**  
Prerequisites: Lecture courses of basic studies in chemistry.

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**780328A: Instrumental Analysis, 4 - 5 op**

**Opiskelumuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Paavo Perämäki, Jalonen Jorma  
**Opintokohteen oppimateriaali:**  
**Opintokohteen kielet:** Finnish  
**Leikkaavuudet:**  
780324A Analytical Chemistry II 4.0 op

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**ECTS Credits:**  
5 - 5.5 credits

**Language of instruction:**  
Finnish.

**Timing:**  
3rd autumn.

**Learning outcomes:**  
After this course the student is familiar with the modern methods of instrumental analysis used both in research laboratories and in industry.

**Contents:**  
Atomic absorption and emission spectrometry; X-Ray fluorescence spectrometry; Molecular fluorescence, phosphorescence and chemiluminescence; NMR spectrometry; Mass spectrometry; Chromatographic methods; Electroanalytical methods; Thermal analysis.

**Learning activities and teaching methods:**  
40 h lectures + 6 h exercises, two intermediate examinations or one final examination.

**Target group:**  
Chemistry, compulsory.

**Recommended optional programme components:**  
Introduction to Analytical Chemistry (780111P).

**Recommended or required reading:**  

**Person responsible:**  
Prof. Paavo Perämäki and Doc. Jorma Jalonen.
782629S: Interactions between Molecules, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Pursiainen Jouni
Opintokohteen oppimateriaali:
Atkins, P. W., , 1998
Reichardt, Christian , , 1988
Opintokohteen kielet: Finnish

ECTS Credits:
4 - 5,5 credits
Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with the principles and applications of intermolecular interactions. Non-covalent intermolecular interactions have fundamental effects in practically all the applications of modern chemistry, including solvent interactions, surface chemistry, catalysis and supramolecular chemistry.
Contents:
The physical background of intermolecular interactions and their applications in solution chemistry and supramolecular chemistry.
Learning activities and teaching methods:
40 h lectures, one final examination.
Target group:
Chemistry.
Recommended or required reading:
Person responsible:
Prof. Kari Laasonen and Prof. Jouni Pursiainen.
Other information:
Prerequisites and completing: 780347A Physical Chemistry I and 782631S Physical Chemistry II.

784627S: Interpretation of Mass Spectra and Workshop, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Jalonen Jorma
Opintokohteen oppimateriaali:
Mclafferty, Fred W., , 1993
Hoffmann, Edmond de , , 2002
Opintokohteen kielet: Finnish

ECTS Credits:
5 - 5,5 credits
Timing:
4th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with the basics of the interpretation of mass spectra.
Contents:
Ionisation methods, fragmentation mechanisms, and basics of the interpretation of mass spectra. Applications in organic and biological chemistry.
Learning activities and teaching methods:
24 h lectures + 10 h exercises + seminar, one final examination.

**Target group:**
Chemistry.

**Recommended optional programme components:**

- **Recommended or required reading:**

**Person responsible:**

**Other information:**
Prerequisites: 780328A Instrumental Analysis and 780317A Structural Chemistry I.

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**780111P: Introduction to Analytical Chemistry, 4 op**

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Paavo Perämäki

**Opintokohteen oppimateriaali:**
Saarinen, Heikki (1), , 2004
Kellner, R., Mermet, J.-M., Otto, M., , 2004

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

780110P Analytical Chemistry I 5.5 op

**ECTS Credits:**
4 credits

**Language of instruction:**
Finnish.

**Timing:**
1st spring.

**Learning outcomes:**
After this course the student is familiar with the main principles of analytical chemistry and classical methods of chemical analysis.

**Contents:**
Steps in quantitative analysis; statistical evaluation of analytical data, aqueous-solution chemistry; gravimetry, titrimetry, spectrophotometry.

**Learning activities and teaching methods:**
30 hours of lectures plus 10 hours of exercises, two intermediate examinations or one final examination.

**Target group:**
Biochemistry, Chemistry, compulsory.
Mathematical Sciences, Physical Sciences, optional.

**Recommended optional programme components:**
Prerequisites: Introduction to Physical Chemistry (780101P) and Introduction to Inorganic Chemistry (780102P); or Basic Principles in Chemistry (780109P).

**Recommended or required reading:**

**Person responsible:**
Prof. Paavo Perämäki.

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**780102P: Introduction to Inorganic Chemistry, 5 op**

Voimassaolo: - 03.06.2013
### ECTS Credits:
5 credits

### Language of instruction:
Finnish

### Timing:
1st autumn.

### Learning outcomes:
After this course the student is familiar with basic concepts of atomic structure, chemical bonding and descriptive chemistry of elements.

### Contents:
Atoms and their structure, chemical bond, descriptive chemistry of elements.

### Learning activities and teaching methods:
30 hours of lectures plus 24 hours of exercises, one final examination.

### Target group:
Biochemistry, Chemistry, compulsory.
Physical Sciences, Mathematical Sciences, optional.

### Recommended optional programme components:
Upper secondary school chemistry.

### Recommended or required reading:

### Person responsible:
Lecturer Leena Kaila.

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### 780103P: Introduction to Organic Chemistry, 6 op

### Opiskelumuoto:
Basic Studies

### Laji:
Course

### Vastuuyksikkö:
Department of Chemistry

### Arvostelu:
1 - 5, pass, fail

### Opettajat:
Koskela, Juha Pekka, Marja Lajunen

### Opintokohteen oppimateriaali:
Hart, Harold, , , 1999

### Leikkaavuudet:

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### 780111P: General and Inorganic Chemistry A (OPEN UNI), 5.0 op

### Opiskelumuoto:
Basic Studies

### Laji:
Course

### Vastuuyksikkö:
Department of Chemistry

### Arvostelu:
1 - 5, pass, fail

### Opettajat:
Leena Kaila

### Opintokohteen oppimateriaali:
Petrucci, R.H., Harwood, W.S., Herring, F.G. and Madura, J.D., , 2007

### Opintokohteen kielet:
Finnish

### Leikkaavuudet:

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ECTS Credits:
6 credits

Language of instruction:
Finnish

Timing:
1st autumn-spring.

Learning outcomes:
After this course the student is familiar with basics of organic chemistry: structure and properties of organic compounds, basic reactions and basic types of mechanisms.

Contents:
Basic reactions of organic compounds, basic principles of stereochemistry and reaction mechanisms, applications.

Learning activities and teaching methods:
52 hours of lectures and applications plus 5 hours of exercises, three intermediate examinations or one final examination.

Target group:
Biochemistry, Chemistry, compulsory.
Physical Sciences, Mathematical Sciences, optional.

Recommended optional programme components:
Upper secondary school chemistry.

Recommended or required reading:

Person responsible:
Prof. Marja Lajunen and Senior assistant Juha Koskela.

780112P: Introduction to Organic Chemistry, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Koskela, Juha Pekka

Opintokohteen oppimateriaali:
Hart, Harold , , 1999
Hart, Harold , , 1999
Opintokohteen kielet: Finnish

Leikkaavuudet:
ay780112P Introduction to Organic Chemistry (OPEN UNI) 4.0 op
780103P Introduction to Organic Chemistry 6.0 op
780103P2 Organic Chemistry I 6.0 op
780108P Basic Course in Organic Chemistry 6.0 op

ECTS Credits:
4 credits

Language of instruction:
Finnish

Timing:
1st autumn-spring.

Learning outcomes:
After this course the student is familiar with basics of organic chemistry: structure and properties of organic compounds, basic reactions and some mechanisms.

Contents:
Basic reactions of organic compounds, applications, basic principles of stereochemistry and some mechanisms.
Learning activities and teaching methods:
32 hours of lectures and applications, two intermediate examinations or one final examination.

Target group:
Biology, Process Engineering, compulsory.
Physical Sciences, Geology, Geoprahpy, Mathematical Sciences, optional.

Recommended or required reading:

Person responsible:
Senior assistant Juha Koskela.

Other information:
Students attend the lectures of 780103 P Introduction of Organic Chemistry, 6 credits.

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780101P: Introduction to Physical Chemistry, 7 op

Voimassaolo: - 31.12.2010
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Pikkarainen, Liisa Marjatta

Opintokohteen oppimateriaali:
Petrucci, Ralph H., , 2002
Petrucci, R.H., Harwood, W.S., Herring, F.G. and Madura, J.D., , 2007

Opintokohteen kielet: Finnish

Leikkaavuudet:
ay780117P General and Inorganic Chemistry A (OPEN UNI) 5.0 op
ay780118P General and Inorganic Chemistry B (OPEN UNI) 5.0 op
780113P Introduction to Chemistry 12.0 op
780109P Basic Principles in Chemistry 4.0 op
780101P2 Physical Chemistry I 4.0 op
780107P Basic Course in Inorganic and Physical Chemistry 7.5 op
780152P Inorganic and Physical Chemistry I 7.5 op
780153P General and Inorganic Chemistry 7.5 op
780154P Basic Inorganic Chemistry 7.5 op

ECTS Credits:
7 credits

Language of instruction:
Finnish

Timing:
1st autumn.

Learning outcomes:
After this course the student is familiar with basic concepts of chemical reactions and equations, stoichiometric calculations, thermodynamics, chemical kinetics and equilibria.

Contents:
Basic concepts of chemistry, chemical formula, chemical reaction, chemical equation, oxidation-reduction reactions, stoichiometry, gases, thermodynamics, phase equilibria, reaction kinetics, chemical equilibrium, acid-base equilibria, equilibria in water solutions of slightly soluble salts.

Learning activities and teaching methods:
52 hours of lectures and applications plus 30 hours of exercises, two intermediate examinations or one final examination.

Target group:
Biochemistry, Chemistry, compulsory.
Physical sciences, Mathematical sciences, optional.

Recommended optional programme components:
Upper secondary school chemistry.

**Recommended or required reading:**

**Person responsible:**
Lecturer Liisa Pikkarainen.

### 780326A: Introduction to Polymer Chemistry, 2 op

**Opiskelumuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Hormi Osmo  
**Opintokohteen oppimateriaali:**  
Stevens, Malcolm P., , 1999  
**Opintokohteen kielet:** Finnish  
**Leikkaavuudet:**  
783650S Introduction to Chemistry 2.0 op  

**ECTS Credits:**  
2 credits  
**Language of instruction:**  
Finnish.  
**Timing:**  
1st spring.  
**Learning outcomes:**  
After this course the student is familiar with basic classification principles of polymeric materials, their nomenclature, their basic properties such as glass transition temperature (Tg), expected stability of polymers as well as the chemistry of main polymerization methods to obtain commodity plastics.  
**Contents:**  
Basic principles, Tg, stability, polymerization of vinylic compounds (radical, ion, Ziegler-Natta) to give commodity plastics.  
**Learning activities and teaching methods:**  
20 h lectures, one final examination.  
**Target group:**  
Chemistry.  
**Recommended optional programme components:**  
Introduction to Organic Chemistry (780103P or 780112P).  
**Recommended or required reading:**  
**Person responsible:**  
Prof. Osmo Hormi.

### 780122P: Introductory Laboratory Course in Chemistry, 3 op

**Opiskelumuoto:** Basic Studies  
**Laji:** Course  
**Vastuuyksikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opintokohteen kielet:** Finnish  

**ECTS Credits:**  
3 - 4 credits  
**Timing:**  
1st autumn or spring.  
**Learning outcomes:**
After this course the student is familiar with basic laboratory tools and experiments.

**Contents:**
Laboratory safety, general laboratory tools and equipment, gravimetric, titrimetric and spectrophotometric analysis, inorganic and organic synthesis, TLC analysis.

**Learning activities and teaching methods:**
40 hours of laboratory works plus demonstrations, one final examination.

**Target group:**
Biochemistry, Biology, Chemistry, Biophysics, Process engineering, compulsory. Physical Sciences, Geology, Mathematical Sciences, optional.

**Recommended optional programme components:**
Previous or simultaneous participation in the course 780101P Introduction to Physical Chemistry or 780109P Basic Principles in Chemistry.

**Recommended or required reading:**

**Assessment methods and criteria:**
- Grading: Pass/fail
- Person responsible: Lecturer L. Pikkarainen and teaching assistants.
- Other information:

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**780697S: Laboratory Course (Teachers), 20 op**

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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**780354A: Laboratory Course I in Inorganic Chemistry, 5 op**

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen kielet: Finnish

Leikkaavuuudet:
780330A-02 Laboratory Course I in Inorganic Chemistry (2. part) 5.0 op

**ECTS Credits:**
5 credits

**Timing:**
2nd period, spring.

**Learning outcomes:**

**Contents:**
Classical quantitative inorganic analysis and basic inorganic synthesis.

**Learning activities and teaching methods:**
80 h laboratory works, 45 h work reports + one final examination.

**Target group:**
Chemistry.
Grading:
75 % laboratory work 25 % final examination.

Person responsible:
Lecturer Leena Kaila.

Other information:
Prerequisites: Lecture courses of basic studies in chemistry.

780330A: Laboratory Course I in Inorganic Chemistry, 7 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen kielet: Finnish

ECTS Credits:
7 - 9 credits

Timing:
Part 2 (780330A-02): 2nd period, spring.

Learning outcomes:
After this course the student is familiar with basic qualitative inorganic chemistry, classical quantitative inorganic chemistry and basic inorganic synthetic chemistry.

Contents:
Part 1: Introduction to inorganic ion reactions.
Part 2: Classical quantitative inorganic analysis and basic inorganic synthesis.

Learning activities and teaching methods:
Part 1: 45 h laboratory work, 10 h work raports + final examination.
Part 2: 80 h laboratory work, 45 h work raports + final examination.

Target group:
Chemistry.

Recommended or required reading:
Part 1: Material handed out in the laboratory.
Part 2: Material handed out in the laboratory.

Grading:
75 % laboratory work 25 % final examination.

Person responsible:
Part 1. Lecturer M. Tiainen and part 2. Lecturer L. Kaila.

Other information:
Lecture courses of basic studies in chemistry.

780330A-01: Laboratory Course I in Inorganic Chemistry (1. part), 2 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Minna Tiainen
Opintokohteen kielet: Finnish

ECTS Credits:
2 credits

780330A-02: Laboratory Course I in Inorganic Chemistry (2. part), 5 op
**780329A: Laboratory Course I in Organic Chemistry, 4 op**

**Opiskelumuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Leena Kaila  
**Opintokohteen kielet:** Finnish

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**ECTS Credits:**  
5 credits

**Timing:**  
2nd period, autumn.

**Learning outcomes:**  
After this course the student is familiar with basic techniques of organic chemistry such as distillation, extraction, crystallization, TLC, as well as safety issues, glassware and equipment, laboratory notebooks and written reporting of laboratory experiments. Student familiarises with practical laboratory work by carrying out reactions in aromatic substitution with protective group strategy, organometallic chemistry, Aldol condensation, elimination and disproportionation.

**Contents:**  

**Learning activities and teaching methods:**  
22 h/week laboratory works.

**Target group:**  
Chemistry.

**Recommended or required reading:**  

**Person responsible:**  
Senior assistant Juha Koskela.

**Other information:**  
Prerequisites: Courses 780101, 780102, 780103, and 780122 passed. Simultaneous participation in the lecture course 780389A.

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**780332A: Laboratory Course I in Organic Chemistry, 4 op**

**Voimassaolo:** 31.07.2013  
**Opiskelumuoto:** Intermediate Studies  
**Laji:** Course  
**Vastuuysikkö:** Department of Chemistry  
**Arvostelu:** 1 - 5, pass, fail  
**Opettajat:** Koskela, Juha Pekka  
**Opintokohteen kielet:** Finnish
ECTS Credits:
4 credits

Timing:
2nd period, autumn.

Learning outcomes:
After this course the student is familiar with basic techniques of organic chemistry such as distillation, extraction, crystallization, TLC, as well as safety issues, glassware and equipment, laboratory notebooks and written reporting of laboratory experiments. Student familiarises with practical laboratory work by carrying out reactions in aromatic substitution with protective group strategy, organometallic chemistry, Aldol condensation, elimination and disproportionation.

Contents:

Learning activities and teaching methods:
22 h/week laboratory works.

Target group:
Biochemistry.

Recommended or required reading:
Laboratory Course Manual.

Person responsible:
Senior assistant Juha Koskela.

Other information:
Prerequisites: Courses 780101, 780102, 780103, and 780122 passed. Simultaneous participation in the lecture course 780389A.

780331A: Laboratory Course I in Physical Chemistry, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Toivo Kuokkanen

Opintokohteen kielet: Finnish

ECTS Credits:
5 - 5,5 credits

Timing:
2nd period, autumn.

Learning outcomes:
After this course the student is familiar with practical applications of the topics learned in 780347A Physical Chemistry I.

Contents:
Calorimetric studies, distribution law, vapour pressure of solvent, partial mole volume, distillation of a mixture of liquids, crystallization of a liquid mixture, potentiometric acid-base titration, determination of equilibrium constant by UV-Vis spectrometry, electromotive force, rate of chemical reaction.

Learning activities and teaching methods:
80 h (7 weeks) laboratory experiments and 45 h reports, one final examination in the beginning.

Target group:
Chemistry.

Recommended or required reading:

Assessment methods and criteria:
Experiments and reports passed.

Person responsible:
Doc. Toivo Kuokkanen and Assistants.

Other information:
Prerequisites: Courses 780101P, 780122P and a preliminary test of the Laboratory course passed. Simultaneous participation in the course 780347A Physical Chemistry I.
780382A: Laboratory Course in Physical Chemistry (TECH), 2 op

Voimassaolo: 31.07.2010
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Toivo Kuokkanen
Opintokohteen kielet: Finnish

ECTS Credits:
2 credits
Timing:
2nd period, autumn.
Learning outcomes:
After this course the student is familiar with the practise of the theory learned in course 780347A Physical Chemistry I.
Contents:
Four experiments of the following topics: Calorimetric studies, determination of equilibrium constant by UV-Vis spectrometry, vapour pressure of solvent, distillation of a mixture of liquids, crystallization of a liquid mixture, adsorption in solution.
Learning activities and teaching methods:
4 laboratory works.
Target group:
Process Engineering.
Recommended or required reading:
Assessment methods and criteria:
Experiments and reports.
Person responsible:
Doc. Toivo Kuokkanen and Assistants.
Other information:
Prerequisites: Courses 780109P, 780122P and a preliminary test of the Laboratory course passed. Simultaneous participation in the course 780347A Physical Chemistry I.

781641S: Laboratory Course in Synthetic Chemistry, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Language of instruction:
Finnish.
Timing:
4th or 5th spring. The courses is lectured every other year.
Learning outcomes:
After this course the student is familiar with most important techniques in modern inorganic and organic synthetic chemistry.
Contents:
Selected syntheses, characterization of products.
Learning activities and teaching methods:
6 h lectures, 60 h laboratory courses, written report, one final examination.
Target group:
Chemistry, optional.
**Recommended optional programme components:**
Laboratory courses in Inorganic Chemistry, Physical Chemistry, and Organic Chemistry, and 780317A Structural Chemistry I.

**Person responsible:**
Prof. R. Laitinen, Prof. M. Lajunen and Prof. J. Pursiainen.

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**783628S: Liquid Chromatography and MS Workshop, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen oppimateriaali:**
Meyer, Veronica R., , 1999

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**
784625S  High Performance Liquid Chromatography and LC/MS Workshop  2.0 op

**ECTS Credits:**
4 credits

**Timing:**
4th or 5th period, autumn. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with basics of liquid chromatography.

**Contents:**
Separation mechanisms. Columns, equipments, detectors. Applications in organic analysis.

**Learning activities and teaching methods:**
24 h lectures + demonstrations + 5 h exercises + report + seminar, one final examination.

**Target group:**
Chemistry

**Recommended optional programme components:**

**Recommended or required reading:**

**Person responsible:**

**Other information:**
Prerequisites: 780111P Introduction to Analytical Chemistry and 780328A Instrumental Analysis.

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**783605S: Literature Survey in Organic Chemistry, 9 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
9 - 11 credits

**Timing:**
Beginning 5h period, autumn.

**Contents:**
The student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The survey can be, but does not necessarily have to be, on the same topic as the research project. The length of the survey should be about 40-60 pages with approximately 50 references.

**Target group:**
Chemistry.
780085Y: Literature of Chemistry and Information Retrieval, 2 op

Voimassaolo: 31.07.2008
Opiskelumuoto: General Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen

ECTS Credits:
2 credits
Timing: 3. period, autumn.
Learning activities and teaching methods: 22 h lectures + exercises, poster.
Target group: Chemistry.
Person responsible: Prof. Marja Lajunen.

781627S: Main Group Chemistry, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Risto Laitinen

Opintokohteen kielet: Finnish

ECTS Credits:
5 - 5.5 credits
Timing: 4th or 5th period, autumn. The advanced courses lectured every year varies year by year.
Learning outcomes: After this course the student is familiar with recent progress in modern main group chemistry.
Contents: Periodic system, hydrogen, alkali and alkaline earth metals, half- and non-metals.
Learning activities and teaching methods: 28 h lectures, 14 h exercises, one final examination.
Target group: Chemistry.
Person responsible: Prof. Risto Laitinen
Other information:
781601S: Master's Thesis in Inorganic Chemistry, 38 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
38 credits
Timing:
Beginning, 5th period, autumn.
Contents:
The thesis for the degree of M.Sc. consists of two parts: a research project (Master’s Thesis) with a written report and a survey of literature. The completion of the laboratory work and the research report is expected to take approximately four months of full-time work. Together, they are worth 38 credits. In addition, the student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The survey can be, but does not necessarily have to be, on the same topic as the research project. The length of the survey should be about 40-60 pages with approximately 50 references. It is worth of 9 credits. The completion of the whole thesis requires about six months of full-time work.
Target group:
Chemistry.
Assessment methods and criteria:
- Grading:
  Approbatu, ..., laudatur.
Person responsible:
Prof., Doc., and Senior assistants and lecturers.
Other information:

781602S: Master’s Thesis in Inorganic Chemistry, 20 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Chemistry
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish

ECTS Credits:
20 credits
Timing:
Beginning 5th period, autumn.
Contents:
The student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The length of the survey should be about 40-60 pages with approximately 50 references.
Target group:
Teacher in the Chemistry.
Assessment methods and criteria:
-Grading:
  Approbatur, ..., laudatur.
Person responsible:
Prof., Doc. and Senior assistants and Lecturers.
783601S: Master's Thesis in Organic Chemistry, 38 op

Opiskelumuoto: Advanced Studies
Laj: Diploma thesis
Vastuuyksikkö: Department of Chemistry
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish

ECTS Credits:
38 credits
Timing:
Beginning, 5th period, autumn.
Contents:
The thesis for the degree of M.Sc. consists of two parts: a research project (Master’s Thesis) with a written report and a survey of literature. The completion of the laboratory work and the research report is expected to take approximately four months of full-time work. Together, they are worth 38 credits. In addition, the student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The survey can be, but does not necessarily have to be, on the same topic as the research project. The length of the survey should be about 40-60 pages with approximately 50 references. It is worth of 9 credits. The completion of the whole thesis requires about six months of full-time work.

Target group:
Chemistry.
Assessment methods and criteria:
- Grading:
  Approbatur, ... , laudatur.
Person responsible:
Prof., Doc. and Senior assistants and Lecturers.
Other information:
-

783602S: Master's Thesis in Organic Chemistry, 20 op

Opiskelumuoto: Advanced Studies
Laj: Diploma thesis
Vastuuyksikkö: Department of Chemistry
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish

ECTS Credits:
20 credits
Timing:
Beginning 5th period, autumn.
Contents:
The student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The length of the survey should be about 40-60 pages with approximately 50 references.

Target group:
Teacher in the Chemistry.
Assessment methods and criteria:
- Grading:
  Approbatur, ..., laudatur.
Person responsible:
Prof., Doc. and Senior assistants and Lecturers.

782601S: Master’s Thesis in Physical Chemistry, 38 op

Opiskelumuoto: Advanced Studies
ECTS Credits:
38 credits

Timing:
Beginning 5th period, autumn.

Contents:
The thesis for the degree of M.Sc. consists of two parts: a research project (Master’s Thesis) with a written report and a survey of literature. The completion of the laboratory work and the research report is expected to take approximately four months of full-time work. Together, they are worth 38 credits. In addition, the student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The survey can be, but does not necessarily have to be, on the same topic as the research project. The length of the survey should be about 40-60 pages with approximately 50 references. It is worth of 9 credits. The completion of the whole thesis requires about six months of full-time work.

Target group:
Chemistry.

Assessment methods and criteria:
- Grading:
  Approbatur,..., laudatur.

Person responsible:
Prof., Doc. and Senior assistants and Lecturers.

Other information:
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782602S: Master's Thesis in Physical Chemistry, 20 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Chemistry
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish

ECTS Credits:
20 credits

Timing:
Beginning 5th period, autumn.

Contents:
The student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The length of the survey should be about 40-60 pages with approximately 50 references.

Target group:
Teacher in the Chemistry.

Assessment methods and criteria:
- Grading:
  Approbatur,..., laudatur.

Person responsible:
Prof., Doc. and Senior assistants and Lecturers.

784601S: Master's Thesis in Structural Chemistry, 38 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
38 credits

Timing:
Beginning, 5th period, autumn.

Contents:
The thesis for the degree of M.Sc. consists of two parts: a research project (Master’s Thesis) with a written report and a survey of literature. The completion of the laboratory work and the research report is expected to take approximately four months of full-time work. Together, they are worth 38 credits. In addition, the student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The survey can be, but does not necessarily have to be, on the same topic as the research project. The length of the survey should be about 40-60 pages with approximately 50 references. It is worth of 9 credits. The completion of the whole thesis requires about six months of full-time work.

Target group:
Chemistry.

Assessment methods and criteria:
-

Grading:
Approbatur,..., laudatur.

Person responsible:
Prof., Doc. and Senior assistants and Lecturers.

Other information:
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784602S: Master's Thesis in Structural Chemistry, 20 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuysikkö: Department of Chemistry
Arvostelu: A,B,N,C,M,EX,L
Opintokohteen kielet: Finnish

ECTS Credits:
20 credits

Timing:
Beginning 5th period, autumn.

Contents:
The student is required to write a survey of literature on a topic which will be decided together with the student's advisor. The length of the survey should be about 40-60 pages with approximately 50 references.

Target group:
Teacher in the Chemistry.

Assessment methods and criteria:
-

Grading:
Approbatur,..., laudatur.

Person responsible:
Prof., Doc. and Senior assistants and Lecturers.

780699S: Maturity Test, 0 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä
780087Y: Maturity test, 0 op

Voimassaolo: - 31.07.2008
Opiskelumuoto: General Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits: 0 credits

782624S: Molecular Modelling, 3 - 4 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laasonen Kari
Opintokohteen oppimateriaali:
Leach, Andrew R., , 1996
Leach, Andrew R., , 2001
Opintokohteen kielet: Finnish

ECTS Credits: 3 - 4 credits
Timing: 4th period, autumn/spring. The advanced courses lectured every year varies year by year.
Learning outcomes: After this course the student is familiar with the principles of molecular modelling, modelling programmes and their use. The emphasis is on the understanding of the theory of molecular dynamics.
Contents: Theoretical principles of molecular dynamics, mainly classical mechanics and modelling of interactions between molecules.
Learning activities and teaching methods: 30 h lectures + 8 h exercises, one final examination.
Target group: Chemistry.
Recommended or required reading: Material given by the lecturer and Leach, A.R.: Molecular Modelling, Longman, 1996 or 2nd ed.
Person responsible: Prof. Kari Laasonen.
Other information: Prerequisites: 782631S Physical Chemistry II and 782630S Quantum Chemistry.

781626S: Molecular Modelling Workshop, 3 - 4 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
ECTS Credits:
3 - 4 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the most common programs in molecular modelling and their use.

Contents:
Basic principles of MO methods and their application in the examination of the structures and reactions of chemical compounds. Introduction to molecular modelling programs and their use.

Learning activities and teaching methods:
8 h lectures, demonstration, practical exercise.

Target group:
Chemistry.

Recommended or required reading:
Material handed out by the lecturer.

Person responsible:
Prof. Kari Laasonen.

Other information:
Prerequisites: 782631S Physical Chemistry II, 782624S Molecular Modelling, 782625S Advanced Quantum Chemistry.

781639S: Molecular Symmetry and Spectroscopy, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail
Opettajat: Raija Oilunkaniemi
Opintokohteen kielet: Finnish

Leikkaavuudet:
780327A Structural Chemistry II 5.5 op

ECTS Credits:
5 credits

Timing:
4th period, spring.

Learning outcomes:
After this course the student is familiar with molecular symmetry and the application of molecular symmetry in vibration spectroscopy and electronic absorption spectroscopy.

Contents:
Molecular symmetry, group theory, vibrational spectroscopy, electronic absorption spectroscopy.

Learning activities and teaching methods:
34 h lectures, 3 home assignments, one final examination.

Target group:
Chemistry.

Recommended or required reading:
Material handed out by lecturer.

Person responsible:
Doc. Raija Oilunkaniemi.

Other information:
Prerequisites: 780353A Inorganic Chemistry I.

784617S: Multinuclear NMR Spectroscopy in Structure Elucidation, 4 op
**ECTS Credits:**
4 credits

**Timing:**
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with the NMR characteristics and use of various magnetic isotopes.

**Contents:**

**Learning activities and teaching methods:**
20 h lectures + applications + demonstration, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Senior assistant Sampo Mattila.

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**784610S: NMR Spectroscopy in Organic Chemistry, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Mattila, Sampo Antero

**Opintokohteen oppimateriaali:**
Breitmaier, Eberhard , , 1993

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 - 7 credits

**Timing:**
4th period, autumn. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with the principles, methods, techniques and practise of structure elucidation of organic compounds by NMR spectroscopy.

**Learning activities and teaching methods:**
14 h lectures + applications, 60 h exercises, one final examinations.

**Target group:**
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Senior assistant Sampo Mattila.

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**784636S: NMR Spectroscopy of Polymers, 4 op**

**Voimassaolo:** - 31.07.2011
Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Väänänen, Taito Lauri Johannes  
Opintokohteen kielet: Finnish

**ECTS Credits:**
4 credits  
**Timing:**
The advanced courses lectured every year varies year by year.  
**Learning outcomes:**
After this course the student is familiar with basic principles of NMR spectroscopy of polymers.  
**Contents:**
Preparation of liquid and solid state sample, the effect of concentration and temperature. Chemical shift and nit’s antisotropy. Dipole-dipole interaction, relaxation time and crosspolarisation and their connection to microstructure of polymers. Identification and quantification. A practical exercise and a report.  
**Learning activities and teaching methods:**
20 h lectures + demonstration + practical exercise + one final examination.  
**Target group:**
Chemistry.  
**Recommended or required reading:**

**Grading:**
-  
**Person responsible:**
Doc. Taito Väänänen.  
**Other information:**
Prerequisites: 784610 NMR Spectroscopy of Organic Chemistry and 784623S NMR workshop I.

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**784623S: NMR Workshop I, 4 op**

Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opettajat: Mattila, Sampo Antero  
Opintokohteen oppimateriaali:  
Derome, Andrew E. , , 1987  
Opintokohteen kielet: Finnish

**ECTS Credits:**
4 credits  
**Timing:**
4th period, autumn or spring. The advanced courses lectured every year varies year by year.  
**Learning outcomes:**
After this course the student is familiar with production of commonly used 1D and 2D NMR spectra, the set up of the acquisitions and the processing of acquired spectra.  
**Contents:**
A practical exercise and a report.  
**Learning activities and teaching methods:**
20 h lectures + demonstration, 80 h exercises, one final examination.  
**Target group:**
Chemistry.
Recommended or required reading:
Derome, A. E., Modern NMR Techniques for Chemistry Research, Pergamon Press (partly).

Person responsible:
Senior assistant Sampo Mattila.

784624S: NMR Workshop II, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Mattila, Sampo Antero
Opintokohteen oppimateriaali:
Derome, Andrew E., 1987
Levitt, Malcolm H., 2001
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Timing:
4th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with production of commonly used 1D and 2D NMR spectra, the set up of the acquisitions and the processing of acquired spectra.
Contents:
-
Learning activities and teaching methods:
20 h lectures + demonstration, 80 h exercises, one final examination.
Target group:
Chemistry.
Recommended or required reading:
Person responsible:
Senior Assistant Sampo Mattila.
Other information:
Prerequisites: 784623S NMR-workshop I.

784638S: NMR Workshop III, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Mattila, Sampo Antero
Opintokohteen oppimateriaali:
Derome, Andrew E., 1987
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits
Timing:
4th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
-
Contents:
-
Learning activities and teaching methods:
20 h lectures + demonstrations, 80 h exercises, one final examination.

Target group:
Chemistry.

Recommended optional programme components:
-

Recommended or required reading:
Derome, A. E., Modern NMR Techniques for Chemistry Research, Pergamon Press (partly).

Person responsible:
Senior assistant Sampo Mattila.

Other information:
Prerequisites: 784623S NMR workshop I.

784639S: NMR Workshop IV, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Mattila, Sampo Antero
Opintokohteen oppimateriaali:
Levitt, Malcolm H., , 2001
Cavanagh, John., , 1996
Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Timing:
4th period, spring. The advanced courses lectured every year varies year by year.

Contents:
-

Learning activities and teaching methods:
20 h lectures + demonstration, 80 h exercises, one final examination.

Target group:
Chemistry.

Recommended optional programme components:
-

Recommended or required reading:

Person responsible:
Senior assistant Sampo Mattila.

Other information:
Prerequisites: 784623S NMR workshop I.

780389A: Organic Chemistry I, 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish
Leikkaavuudet:
780385A Organic Chemistry I 9.0 op
ECTS Credits:
6 credits

Language of instruction:
Finnish.

Timing:
2nd autumn.

Learning outcomes:
After this course the student is familiar with the nature of chemical bonds in organic compounds and the basic principles of the bonding molecular orbitals in small organic compounds. The student familiarizes also with how HOMO-LUMO concepts can be used to anticipate organic reactivity. Other important items are also conformational analysis, basics in physical organic chemistry, especially the Hammett plot approach to reaction mechanisms. The student is also familiar with details in nucleophilic substitution reactions and stereochemistry with emphasis on stereoselective reactions.

Contents:
Chemical bond, conformation analysis, reaction mechanisms, nucleophilic substitution, stereochemistry.

Learning activities and teaching methods:
50 h lectures, two intermediate examinations or one final examination.

Target group:
Chemistry, compulsory.

Recommended optional programme components:
Introduction to Organic Chemistry (780103P) and Physical Chemistry I (780347A).

Recommended or required reading:

Person responsible:
Prof. Osmo Hormi.

783643S: Organic Chemistry II, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen

Opintokohteen oppimateriaali:

Opintokohteen kielet: Finnish

Leikkaavuudet:
780393A Organic Chemistry II 4.0 op
780390A Organic Chemistry II 4.0 op

ECTS Credits:
4 credits

Timing:
4th period, autumn.

Learning outcomes:
After this course the student has a good knowledge of selected mechanisms and reasons affecting them.

Contents:
Polar addition and elimination reactions, chemistry of enols and enolates, aromatic heterocyclic compounds and their reactions.

Learning activities and teaching methods:
30 h lectures + 6 h exercises, two intermediate examinations or one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Marja Lajunen.

Other information:
Prerequisites: 780389A Organic Chemistry I.
783639S: Organic Chemistry III, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
Opintokohteen oppimateriaali:
Corey, E. J. , 1989
Opintokohteen kielet: Finnish

ECTS Credits:
5 - 5,5 credits
Timing:
5th period, autumn.

Learning outcomes:
After this course the student is familiar with the modern organic chemistry involved in challenging organic synthetic endeavours published in current chemical literature and journals.

Contents:
Synthetic strategies based on transformation, strategies based on structure, typological strategies, stereochemical strategies, strategies based on functional groups, multistrategies, oxidation and reduction methods, protection of functional groups, multistep synthesis.

Learning activities and teaching methods:
26 h lectures + seminar.

Target group:
Chemistry.

Recommended optional programme components:

Recommended or required reading:

Assessment methods and criteria:
Written report on the synthesis of a complex target molecule and an oral presentation of the synthesis.

Person responsible:
Prof. Osmo Hormi.

Other information:
Prerequisites: 780389A Organic Chemistry I and 783643S Organic Chemistry II.

783614S: Organic Chemistry of Drug Compounds, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen
Opintokohteen oppimateriaali:
Patrick, Graham L. , 2001
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits

Learning outcomes:
After this course the student is familiar with basic principles and techniques of medicinal chemistry, tactics and tools used in drug design and development.

Learning activities and teaching methods:
20 h lectures, one final examination.

Target group:
Chemistry.
Recommended or required reading:

Person responsible:
Prof. Marja Lajunen.

Other information:
Prerequisites: 780389A Organic Chemistry I and 783643S Organic Chemistry II.

783640S: Organometallic Chemistry, 3 op

Opiskelumuto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen

Opintokohteen oppimateriaali:
Jenkins, Paul R., , 1992
Thomas, Susan E., , 1991

Opintokohteen kielet: Finnish

ECTS Credits:
3 - 5 credits

Timing:
4th period, autumn. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with essential organometallic compounds and reagents and their use in synthetic applications.

Contents:
Bonding of metals with organic ligands, transition metals in organic synthesis, metal carbenoids, homogeneous catalysis, ligand design for metal complexes, asymmetric reactions.

Learning activities and teaching methods:
24 h lectures, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Marja Lajunen.

Other information:
Prerequisites: 783643S Organic Chemistry II.

780078Y: Orientation Course for New Students, 1 op

Opiskelumuto: General Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Kopsa-Moilanen, Vieno Maria

Opintokohteen kielet: Finnish

ECTS Credits:
1 - 2 credits

Timing:
1. period, autumn-spring.

Target group:
Chemistry.
783638S: Paper Chemistry, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
Opintokohteen oppimateriaali:
Eklund, Dan, ., 1991
Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with most important chemicals used in papermaking. The student is also familiar with the basics in colloid and surface chemistry which is important to understand the behaviour of pulp substances during papermaking.

Contents:

Learning activities and teaching methods:
24 h lectures, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Osmo Hormi.

Other information:
Prerequisites: 780326A Introduction to Polymer Chemistry.

783645S: Pericyclic chemistry, 3 op

Voimassaolo: 01.01.2008 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Marja Lajunen
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

Timing:
4th or 5th period, spring.

Learning outcomes:
After this course unit the student is familiar with a nature and types of pericyclic reactions. He/she understands the occurence of separate pericyclic reactions, basics of click chemistry and synthetic uses of pericyclic reactions.

Contents:
Pericyclic reaction types: cycloadditions, sigmatropic rearrangements, group transfer and electrocyclic reactions. The Woodward-Hoffman rules, thermal, photochemical, 1,3-dipolar cycloaddition and basics of click chemistry alike.

Learning activities and teaching methods:
20 h lectures, one final examination.
Target group:
Chemistry.
Recommended or required reading:
Person responsible:
Prof. Marja Lajunen.
Other information:
Prerequisites: 780389A Orgaaninen kemia I ja 783643S Organic Chemistry II.

780347A: Physical Chemistry I, 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Pursiainen Jouni
Opintokohteen oppimateriaali:
Atkins, P.W., , 2002
Atkins, P. W., , 1998
Opintokohteen kielet: Finnish
Leikkaavuudet:
780318A Physical Chemistry II 6.5 op

ECTS Credits:
5.5 - 6 credits
Language of instruction:
Finnish.
Timing:
2nd autumn.
Learning outcomes:
After this course the student is familiar with the main topics of chemical thermodynamics and kinetics. During the course such concepts are introduced that are needed for the discussion of equilibria in chemistry. Much emphasis is in enthalpy, entropy and Gibbs energy. A unified view of equilibrium and the directions of spontaneous change are obtained in terms of chemical potentials of substances. Chemical kinetics shows how the systems can reach equilibrium.
Contents:
Properties of gases, the first and second laws of thermodynamics, physical transformations of pure substances, properties of simple mixtures, chemical equilibrium.
Learning activities and teaching methods:
56 h lectures + applications + 14 h exercises, two intermediate examinations or one final examination.
Target group:
Chemistry, compulsory.
Recommended optional programme components:
Introduction to Physical Chemistry (780101P) and Introduction to Inorganic Chemistry(780102P); or Basic Principles in Chemistry(780109P). Laboratory Course I in Physical Chemistry (780331A) has to be taken simultaneously with this course.
Recommended or required reading:
Person responsible:
Prof. Jouni Pursiainen.

782631S: Physical Chemistry II, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Leikkaavuudet:
780392A  Physical Chemistry II  4.0 op
780349A  Physical Chemistry II  4.0 op

ECTS Credits:
4 credits

Timing:
4th period, autumn.

Learning outcomes:
After this course the student is familiar with quantum mechanics and molecular level phenomena.

Contents:
Basic principles of quantum mechanics, statistical thermodynamics, molecules in motion.

Learning activities and teaching methods:
36 h lectures + 8 h assignment exercises, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Kari Laasonen.

Other information:
Prerequisites and completion: 780347A Physical Chemistry I. 782632S Laboratory Course II in Physical Chemistry has to be taken simultaneously with this course.

783620S: Polymer Chemistry, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Hormi Osmo

Opintokohteen oppimateriaali:
Elias, Hans-Georg, , 1993

Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits

Timing:
4th period, autumn. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the most usual molecular weights of polymers, the structure of polymers including theoretical aspects of end to end distances, thermal properties of polymers, rheology and visco-elastic behaviour of polymers and electrical properties of polymeric materials.

Contents:
Molecular weights of polymers, the structure of polymers and theoretical aspects of end to end distances, thermal properties of polymers, rheology and visco-elastic behaviour of polymers including both practical and theoretical aspects, electrical properties of polymer.

Learning activities and teaching methods:
28 h lectures, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
783636S: Polymer Chemistry in Materials Sciences, 3 - 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo

Opintokohteen oppimateriaali:
Fawcett, A.H. (toim.), , 1991
Metals Park, , 1988
Joseph N. Epel. (et al.), , 1988
Flinn, Richard A. , , 1990

Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the most important technical properties of industrially important polymer materials. Main emphasis is placed on polymeric materials that can in used in supporting structures and must therefore have a high modulus and high strength. The student becomes familiar with polymers in composite structures as well as with lightweight high modulus and high strength carbon and Kevlar fibres and liquid crystalline main chain polyesters. The chemistry high temperature polymers become also familiar as well as some methods to fabricate strengthened materials such as strengthened tape.

Contents:
Technically important features of polymers, the chemistry of carbon fibres, Kevlar fibres main chain liquid crystal polymers, heat stable polymers, epoxy polymers, composites, chemistry of wet lay-up resins, filament winding resins and prereg resins.

Learning activities and teaching methods:
24 h lectures, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Osmo Hormi.

Other information:
Prerequisites: 780326A Introduction to Polymer Chemistry.

782630S: Quantum mechanics and Spectroscopy, 3 op

Voimassaolo: - 31.07.2010
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laasonen Kari

Opintokohteen oppimateriaali:
Atkins, Peter , , 2006
Atkins, P. W., , 1997
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

Timing:
4th period, spring.

Learning outcomes:
After this course the student is familiar with the application of quantum mechanics to molecular structure and spectroscopy.

Contents:
Schrödinger equation for molecules, LCAO-theory. The interaction between light and matter – IR and Raman spectroscopy. Matter in magnetic field – NMR spectroscopy.

Learning activities and teaching methods:
30 h lectures + 6 h assignment exercises, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Kari Laasonen.

Other information:
Prerequisites: 782631S Physical Chemistry II.

781623S: Reaction Mechanisms in Inorganic Chemistry, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Laitinen Risto

Opintokohteen kielet: Finnish

ECTS Credits:
3 - 4 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with present state of inorganic reaction mechanisms.

Contents:
Mechanistic implications of reaction kinetics, collision theory, transition state theory, study of reaction mechanisms, molecular structure and mechanisms, orbital symmetry, substitution reactions, electron transfer reactions, catalysis, photochemical reactions.

Learning activities and teaching methods:
24 h lectures + 2 home assignments, one final examination.

Target group:
Chemistry.

Recommended or required reading:
Material handed out by the lecturer.

Person responsible:
Prof. Risto Laitinen.

Other information:
Prerequisites: 780353A Inorganic Chemistry I and 781642S Inorganic Chemistry II.

780601S: Research Project, 12 op

Opiskelumuoto: Advanced Studies
 course:  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish

ECTS Credits:  
12 credits  
Timing:  
Beginning 4th period, autumn.  
Learning activities and teaching methods:  
240 h laboratory works.  
Target group:  
Chemistry.  
Person responsible:  
Prof., Doc., Senior assistants and Lecturers.

783634S: Research Seminar in Organic Chemistry, 2 op

Voimassaolo: 01.08.2012 -  
Opiskelumuoto: Advanced Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish

ECTS Credits:  
3 - 4 credits  
Timing:  
Autumn + spring.  
Learning outcomes:  
After taking part in seminars the student is familiar with scientific reporting and oral presentation of results.  
Contents:  
Design and following of projects in organic chemistry.  
Target group:  
Chemistry.  
Person responsible:  
Prof. Osmo Hormi and Prof. Marja Lajunen.

787602J: Research Seminar in Organic and Polymer Chemistry, 3 op

Opiskelumuoto: Post-graduate Studies  
Laji: Course  
Vastuuysikkö: Department of Chemistry  
Arvostelu: 1 - 5, pass, fail  
Opintokohteen kielet: Finnish

ECTS Credits:  
3 - 4 credits  
Timing:  
Autumn + spring.  
Learning outcomes:  
After this course the student is familiar with current projects in the research laboratory of polymer chemistry and can present own research results in English.  
Contents:  
Weekly english seminar to students. Compulsory attendance and oral presentation of own projects during a period of one year.
Learning activities and teaching methods:
30 h.
Target group:
Chemistry.
Person responsible:
Prof. Osmo Hormi and Prof. Marja Lajunen.

780301A: Research Training, 9 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Toivo Kuokkanen, Leena Kaila
Opintokohteen kielet: Finnish

ECTS Credits:
9 credits
Timing:
3rd autumn-spring.
Learning outcomes:
After this course the student is able to work on laboratory independently and will be able to produce formal written laboratory reports.
Contents:
Laboratory works in inorganic, physical and organic chemitry 80 h/laboratory. Additionally, written laboratory reports, one per practical.
Learning activities and teaching methods:
240 h laboratory works.
Target group:
Chemistry, compulsory.
Recommended optional programme components:
The compulsory courses of chemistry in the first and second year.
Person responsible:
Assistants.

780301A-01: Research Training, 3 op

Voimassaolo: 01.08.2006 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Kaila
Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

780301A-03: Research Training, 3 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
ECTS Credits: 3 credits
Person responsible: Senior assistant Juha Koskela + assistants.

780301A-02: Research Training, 3 op

Voimassaolo: 01.08.2006 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits: 3 credits

781640S: Sampling and Sample Preparation, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Paavo Perämäki
Opintokohteen oppimateriaali:
Dean, John R., 2003
Opintokohteen kielet: Finnish
Leikkaavuudet:
781335A Sampling and Sample Preparation 4.0 op

ECTS Credits: 4 credits
Timing: 4th or 5th period, spring. The advanced courses lectured every year varies year by year.
Learning outcomes:
After this course the student is familiar with the different phases and special tasks between sampling and sample preparation both in inorganic and organic analytics.
Contents:
Sampling, sample storage and pre-treatment. Sample preparation for inorganic and organic analysis.
Learning activities and teaching methods:
24 h lectures + seminar, one final examination.
Target group:
Chemistry.
Recommended or required reading:
Person responsible:
Prof. Paavo Perämäki and Doc. Jorma Jalonen.

781647S: Scanning electron microscopy, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Minna Tiainen

Opintokohteen oppimateriaali:
Goodhew, Peter J., 2001

Opintokohteen kielet: Finnish

ECTS Credits:
3 credits

Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with function of scanning electron microscope and applications.

Contents:
Microscope and function, interactions between electrons and the sample, scanning electron microscope, chemical characterisation with electron microscope.

Learning activities and teaching methods:
20 h lectures, learning dairy and essay, presence in the lectures.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Lecturer Minna Tiainen.

Other information:
Prerequisites: Inorganic Chemistry I (780353A).

780690S: Seminar, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
4 credits

Timing:
5th period, spring.

Contents:
The student gives one presentations on a given scientific subject and distributes an abstract to the audience. One of the presentations is fiven in English.

Target group:
Chemistry.

780086Y: Seminar for the Degree of B.Sc., 1 op

Voimassaolo: - 31.07.2008

Opiskelumuoto: General Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
1 credits

Timing:
3rd spring.
Contents:
The student gives one presentation on a given scientific subject related to B.Sc. thesis (20 min.) and distributes an abstract to the audience.

Target group:
Chemistry, compulsory.

Other information: 

781630S: Seminar in Inorganic Chemistry, 2 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Paavo Perämäki, Laitinen Risto
Opintokohteen kielet: Finnish

ECTS Credits: 3 - 4 credits
Timing: 4th and 5th period.
Learning outcomes: After this course the student is familiar with recent development in inorganic chemistry.
Contents: Varies from year by year.
Learning activities and teaching methods: 20 h. Presence in the lectures and two seminar.
Target group: Chemistry.
Person responsible: Prof. Risto Laitinen and prof. Paavo Perämäki.

782623S: Seminar in Physical Chemistry, 2 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits: 4 credits

788602S: Seminar in Structural Chemistry, 2 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Mattila, Sampo Antero
Opintokohteen kielet: Finnish

ECTS Credits: 
2 credits
**Timing:**
Spring and autumn.

**Learning activities and teaching methods:**
20 h seminars.

**Target group:**
Chemistry.

**Person responsible:**
Senior assistants Sampo Mattila.

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**781611S: Solid State Chemistry, 4 op**

**Voimassaolo:** 31.07.2015

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Laitinen Risto

**Opintokohteen oppimateriaali:**
West, Anthony R., , 1988

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits

**Timing:**
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with 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 outer conditions on some reactions, phase diagrams and their applications, optical, magnetic and electric properties of solid materials, and industrial applications.

**Learning activities and teaching methods:**
28 h lectures, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**

**Person responsible:**
Prof. Risto Laitinen.

**Other information:**
Prerequisites: 780347A Physical Chemistry I and 780353A Inorganic Chemistry I.

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**781631S: Statistical Methods in Analytical Chemistry, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Paavo Perämäki

**Opintokohteen oppimateriaali:**

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 - 5,5 credits
Timing:
4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes:
After this course the student is familiar with the basic statistical methods used for data handling and analysis in analytical chemistry (including calibration and validation of analytical methods).

Contents:
Introduction to statistical methods, significance tests, analysis of variance, methods of regression, concepts of instrument analysis, planning of experiments and optimisation of analytical chemical methods.

Learning activities and teaching methods:
30 h lectures + 10 h exercises and practical exercise, one final examination.

Target group:
Chemistry.

Recommended or required reading:

Person responsible:
Prof. Paavo Perämäki.

Other information:
Prerequisites: 780111P Introduction to Analytical Chemistry.

780317A: Structural Chemistry I, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Jalonen Jorma, Mattila, Sampo Antero
Opintokohteen oppimateriaali:
Opintokohteen kielet: Finnish
Leikkaavuudet:
784640S Structural Chemistry I 5.0 op

ECTS Credits:
5 - 5.5 credits

Language of instruction:
Finnish.

Timing:
3rd autumn.

Learning outcomes:
After this course the student is familiar with the basics of interpretation of IR, NMR and mass spectra.

Contents:
Principles of the interpretation of IR, NMR and mass spectra and methods of problem solving with the aid of IR, NMR and mass spectra.

Learning activities and teaching methods:
40 h lectures, 20 h demonstrations and exercises, one final examination.

Target group:
Chemistry, compulsory.

Recommended optional programme components:
Physical Chemistry I (780347A) and Introduction to Analytical Chemistry (780111P).

Recommended or required reading:

Person responsible:
Doc. Jorma Jalonen and Senior Assistant Sampo Mattila.

781614S: Structural Methods in Inorganic Chemistry, 3 op

Opiskelumuoto: Advanced Studies
ECTS Credits: 
3 - 4 credits

Timing: 
4th or 5th period. The advanced courses lectured every year varies year by year.

Learning outcomes: 
After this course the student is familiar with applications of multinuclear NMR spectroscopy in inorganic chemistry.

Contents: 
Applications of NMR Spectroscopy in inorganic chemistry.

Learning activities and teaching methods: 
20 h lectures + seminar, one final examination.

Target group: 
Chemistry.

Recommended or required reading: 
Material handed out by the lecturer.

Person responsible: 
Doc. Raija Oilunkaniemi.

Other information: 
Prerequisites: 780353A Inorganic Chemistry I and 780317A Structural Chemistry I.

782620S: Surface Chemistry I, 3 op

ECTS Credits: 
3 - 4 credits

Timing: 
4th or 5th period, autumn. The advanced courses lectured every year varies year by year.

Learning outcomes: 
After this course the student is familiar with properties of surfaces (liquid-gas, solid-gas, and solid-liquid).

Contents: 
Introduction to the properties of surfaces (liquid-gas, solid-gas and solid-liquid). Some applications will be discussed, for example friction, lubrication, emulsion, foams, flotation, chemisorption, and catalysis.

Learning activities and teaching methods: 
30 h lectures, one final examination.

Target group: 
Chemistry.

Recommended or required reading: 

Assessment methods and criteria: 
Examination based on the lectures.

Person responsible: 
Prof. Kari Laasonen.

Other information: 
Prerequisites: 782631S Physical Chemistry II.
**782633S: Surface chemistry II, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Ulla Lassi

**Opintokohteen oppimateriaali:**
- Adamson, Arthur W., 1997
- Somorjai, Gabor A., 1994

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 credits

**Timing:**
4th or 5th period, spring.

**Learning outcomes:**
After the course the student is familiar with interfaces (solid-gas, solid-liquid), properties of surfaces and surface phenomena. Student knows the most important surface structures and methods used in surface science studies. Surface phenomena are significant in several industrial applications, and those applications are theoretically studied during the course.

**Contents:**
Properties of solid-gas and solid-liquid interfaces, Surface structures, Surface phenomena and Surface analytical methods. Heterogeneous catalysis at solid surfaces is studied as an application.

**Learning activities and teaching methods:**
30 h lectures, one final examination.

**Target group:**
Chemistry.

**Recommended or required reading:**
- Adamson, A.W.: Physical Chemistry of Surfaces, 6th edition, John Wiley and Sons, New York, 1997 (to the appropriate extent);

**Assessment methods and criteria:**
Examination based on the lectures.

**Person responsible:**
Prof. Ulla Lassi.

**Other information:**
Prerequisites: Physical Chemistry I and II.

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**783642S: Synthetic Methods in Green Chemistry, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuysikkö:** Department of Chemistry

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Marja Lajunen, Jalonen Jorma

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits

**Timing:**
4th or 5th period. The advanced courses lectured every year varies year by year.

**Learning outcomes:**
After this course the student is familiar with basics of ionic liquids and their use in synthetic applications. Student knows fundamentals of microwave technique, organic reactions in water, supercritical liquids as solvents, syntheses in fluorous, two-phase systems.

**Contents:**
Ionic liquids and their properties and use in synthetic applications. Introduction to microwave technique and microwave-assisted organic synthesis. Organic reactions in water. Supercritical liquids as solvents. Syntheses in fluororous, two-phase systems.

Learning activities and teaching methods:
20 h lectures, 2 h demonstrations, one final examination.

Target group:
Chemistry.

Recommended or required reading:
Material given by the lecturer.

Person responsible:

Other information:
Prerequisites: 780389A Organic Chemistry I and 783643S Organic Chemistry II.

780300A: Thesis for the Degree of B.Sc., 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Timing:
3rd autumn (beginning).
Contents:
A thesis of approximately 20-40 pages including about 30 references. In addition, the student takes a maturity examination on the subject of the B.Sc. thesis in order to show a perfect command of either Finnish or Swedish (Finnish students) and a good knowledge of the subject of the thesis.

Target group:
Chemistry, compulsory.

Grading:
Pass/fail.

Person responsible:
Professors, Docents, Lecturers and Senior assistants.

780079Y: Tutoring, 1 op

Opiskelumuoto: General Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Kopsa-Moilanen, Vieno Maria
Opintokohteen kielet: Finnish

ECTS Credits:
1 - 2 credits

783619S: Wood Chemistry, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuysikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Hormi Osmo
ECTS Credits: 3 - 4 credits

Timing: 4th or 5th period, autumn or spring. The advanced courses lectured every year varies year by year.

Learning outcomes: After this course the student is familiar with macroscopic structure of wood and their most important cell types used in the papermaking and in the production other cellulose based materials. The student is also familiar with basics of carbohydrate chemistry in order to understand the chemistry of cellulose and hemicelluloses as well as the chemistry of lignin. The student is also familiarized with the chemistry of sulphite and sulphate pulping as well as with the chemistry of ligning removing bleaching, chemistry of extractives as well as with the chemistry of the most important compounds in bark.


Learning activities and teaching methods: 24 h lectures, one final examination.

Target group: Chemistry.


Person responsible: Prof. Osmo Hormi.

Other information: Prerequisites: Introduction to Organic Chemistry (780103P)

781646S: X-Ray Chrystallography, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuysikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Laitinen Risto

Opintokohteen kielet: Finnish

ECTS Credits: 6 credits

Timing: 4th or 5th period, spring. The advanced courses lectured every year varies year by year.

Learning outcomes: After this course the student is familiar with basic concepts of crystal symmetry, the fundamentals of crystal structure determination, and has some hands-on experience in the structure determination.

Contents: Crystal classes, crystal symmetry, scattering of X-rays in crystalline material, determination of the crystal structure from single crystals.

Learning activities and teaching methods: 36 h lectures + 8 h demonstrations + practical exercise with a written report, one final examination.

Target group: Chemistry.

Person responsible: Prof. J. Valkonen (University of Jyväskylä) and Prof. R. Laitinen.

Other information: Prerequisites: 780353A Inorganic Chemistry I and 781639S Molecular Symmetry and Spectroscopy.