

# Opasraportti

## Courses in English for exchange students, Biochemistry (2014 - 2015)

### Courses in English for exchange students, Biochemistry

This Course Catalogue lists courses taught in English for exchange students at the Faculty of Biochemistry and Molecular medicine during the academic year 2014-2015.

The Faculty of Biochemistry and Molecular Medicine was formed on 1st January 2014 by a merger between of the Department of Biochemistry (Faculty of Science) and the Department of Medical Biochemistry and Molecular Biology (Faculty of Medicine). The physical merger will occur in summer 2014 and the faculty will be located on the Kontinkangas campus.

When planning your exchange studies and the required learning agreement please use the information provided under the **Courses** tab in this catalogue. Please read carefully the information of each course you wish to take (language of instruction, target group, course content, TIMING (autumn or spring term), preceding studies, other information containing LOCATION OF INSTRUCTION).

The first year and the autumn term of the second year biochemistry courses (lecture parts) of the BSc will be taught at the LINNANMAA CAMPUS, with the remaining education and all laboratory parts provided at the KONTINKANGAS CAMPUS.

All exchange students must submit their exchange application through SoleMOVE, learning agreement is attached to the on-line application.

Accepted exchange students are required to register to all courses. Course registration takes place once you have arrived in Oulu and received your University of Oulu login information. More information on registration will be provided during orientation. When registering you will be able to find detailed information on teaching and schedule under **Instruction** tab.

Individual course codes include information on the level of course.

xxxxxP, xxxxxY = basic, introductory level courses

xxxxxA = for 2-3 year students, Bachelor level courses

xxxxxS = for 4-5 year students, Master level courses

In order to participate courses You should have enough background (especially for laboratory parts).

If You are going to have internship period in research laboratory please contact directly group leaders in the faculty and ask a position ( <http://www oulu.fi/fbmm/>). You will be given 1.5 ECTS credits for each full week (40 hr) in the laboratory (see 746606S Project work in biochemistry).

Any general questions about courses in English at the Faculty of Biochemistry and Molecular Medicine should be addressed to:

jari.heikkinen@oulu.fi

Further information on application process for incoming exchange students:

<http://www.oulu.fi/english/studentexchange>

international.office(at)oulu.fi

## Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

747605S: Basic aspects of protein crystallographic methods, 3 op  
 740144P: Biochemical Methodologies I, 8 op  
 747608S: Biochemical methodologies II, 8 op  
 743659S: Biochemistry of cell organelles, 3 op  
 747611S: Biochemistry of protein folding, 3 op  
 747603S: Bioinformatics, 2,5 op  
 740148P: Biomolecules, 5 op  
 740143P: Biomolecules for Biochemists, 8 op  
 743658S: Cell cycle, DNA replication and repair, 2,5 op  
 740366A: Cellular Communication, 6 op  
 747604S: Introduction to biocomputing, 3 op  
 740379A: Introduction to immunology, 3 op  
 747612S: Introduction to structure-based drug discovery, 4 op  
 740363A: Microbiology, 6 op  
 740374A: Microbiology, 3 op  
 744621S: Molecular biology II, 3 op  
 743655S: Neurobiology, 4 op  
 740145P: Physical Biochemistry, 6 op  
 740371A: Physiological Biochemistry, 4 op  
 746606S: Project work in Biochemistry, 1,5 op  
 740364A: Protein Chemistry I, 8 op  
 744620S: Protein chemistry II, 3 op  
 747601S: Protein production and analysis, 8 op  
 747606S: Structural enzymology, 3 op  
 744619S: Systems biology, 4 op  
 743657S: Tumor cell biology, 3 op  
 740380A: Virology, 3 op  
 744623S: Yeast genetics, 6 op

## Opintojaksojen kuvaukset

### Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

**747605S: Basic aspects of protein crystallographic methods, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Wierenga Rikkert

**Opintokohteen kielet:** English

**Leikkaavuudet:**

744615S Basic aspects of protein crystallographic methods 3.0 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- describe the key aspects of the protein crystallization methods
- describe the importance of crystals for obtaining the structure of a protein
- describe the importance of the Fourier transform method in the structure determination method
- describe the phase problem
- describe the importance of the anomalous differences

**Contents:**

The course will describe the principles of x-ray diffraction theory. It will focus on aspects used in the field of protein crystallography including following topics: Crystallisation of proteins, symmetry properties of crystals, X-ray sources and detectors, the diffraction pattern and the reciprocal lattice, the phase problem, isomorphous differences and the MIR-method, anomalous differences and the MAD-method.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures and seminars

**Target group:**

M.Sc. in Protein Science and biotechnology

**Prerequisites and co-requisites:**

Biomolecules and Protein chemistry I or Protein production and analysis or equivalent

**Recommended optional programme components:**

-

**Recommended or required reading:**

Drenth, J.: Principles of protein X-ray crystallography (2nd edition); Blow, D.: Outline of crystallography for biologists (1st edition, 2002)

**Assessment methods and criteria:**

Oral presentation

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

**Grading:**

pass/fail

**Person responsible:**

Rik Wierenga

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 740144P: Biochemical Methodologies I, 8 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Jari Heikkinen

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay740153P Basic biochemistry 2: Methods (OPEN UNI) 2.0 op

740151P Biochemical methodologies I 10.0 op

740117P Basic methods in biochemistry 4.0 op

740136P Laboratory course in basic methods of biochemistry 3.0 op

**Voidaan suorittaa useasti:** Kyllä

**ECTS Credits:**

8 credits

**Language of instruction:**

Finnish

**Timing:**

B.Sc. yr1 autumn (lectures), yr1 spring (laboratory practicals)

**Learning outcomes:**

Upon successful completion students are able to:

- use basic methods used in biochemical research laboratory
- Use laboratory equipment and work safely
- Prepare solutions used in the lab
- document experiments in the laboratory

**Contents:**

This module covers the basic methodologies used in practical biochemistry. The following topics will be addressed: safety in the laboratory, qualitative and quantitative observations, the calculations of concentrations and dilution factors (includes a workshop), pipette cleaning and calibration, identification and quantification of biological molecules, principles and practice of the use of centrifuges, spectrophotometry, SDS-PAGE, agarose gel electrophoresis, thin-layer and paper chromatography, basics of protein purification, extraction of chromosomal DNA from bacteria, mini-prep extraction of plasmid DNA, extraction of RNA from mammalian tissue, extraction of lipids from nutmeg, sterile technique, basic microbial growth, dialysis, filtration and pH measurement.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

18 h le, 2h exercises, 120 h lab. Laboratory work is compulsory. It is possible to complete lecture part only (3.5 ECTS).

**Target group:**

Major students, Biology BSC-BS

**Prerequisites and co-requisites:**

Biomolecules, Biomolecules for Biochemists tai Biomolecules for Bioscientists

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Continuous assessment (home works, lab reports), final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Jari Heikkinen

**Working life cooperation:**

No

**Other information:**

Location of instruction: lectures (in Finnish) at Linnanmaa campus, laboratory practicals at Kontinkangas campus.

## 747608S: Biochemical methodologies II, 8 op

**Voimassaolo:** 01.08.2009 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Ulrich Bergmann

**Opintokohteen kielet:** English

**Leikkaavuudet:**

740365A Biochemical Methodologies II 8.0 op

**ECTS Credits:**

8 credits

**Language of instruction:**

English

**Timing:**

MSc 1st autumn

**Learning outcomes:**

Upon successful completion students are able to:

- describe the theoretical basis of the main biochemical analysis methods for proteins
- identify and use the different instruments
- describe the potential of the different analytical techniques and develop strategies for addressing specific questions in protein & proteome-analysis
- integrate data from multiple sources and evaluate it critically

**Contents:**

During this module students will analyze their own protein samples. The course will cover principles and practical applications of some of the more advanced methodologies used in practical biochemistry, including fluorescence spectroscopy, stopped flow analysis of enzymatic reactions, circular dichroism, surface plasmon resonance, micro-calorimetry, mass spectrometry, and proteomics based on 2D electrophoresis. For assessment each student has to write a research report in the style of a scientific publication. Attendance is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

120 h lab., including pre-lab lectures plus exercises

**Target group:**

Obligatory for M.Sc. in Protein Science and biotechnology

**Prerequisites and co-requisites:**

Protein production and analysis (747601S) or Protein chemistry I (740364A)

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Report written in style of a scientific publication

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

1-5/fail

**Person responsible:**

Ulrich Bergmann

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**743659S: Biochemistry of cell organelles, 3 op**

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Vasily Antonenkov

Opintokohteen kielet: English

**Leikkaavuudet:**

743656S Biochemistry of cell organelles 2.5 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- Describe structure and function of the key cell organelles
- Discuss role of organelles in pathology
- Characterize metabolite transfer and action of channels and transporters
- Assess basic principles of biogenesis of cell organelles

**Contents:**

The course covers basic aspects of cell and membrane biology providing knowledge on structure and function of mitochondria, endoplasmic reticulum (ER) and peroxisomes. More detailed discussion will be on aspects of mitochondrial inheritance, function in health and diseases, mitophagy, role of organelles in aging, lipid synthesis in ER, intra- and extracellular transfer of lipids, structural and functional properties of membrane channels and transporters, soluble metabolite-transfer proteins, integration of different functions in peroxisomes. In addition to lectures (16 h) the course involves two seminars (4 h) where the students should present reports of cellular lipid traffic and isolation of cellular organelles.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures and student presentations in seminars

**Target group:**

Major students/Molecular and cellular biology

**Prerequisites and co-requisites:**

B.Sc. in biochemistry or biology or otherwise adequate knowledge on basic biochemistry, cellular and molecular biology

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Vasily Antonenkov

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 747611S: Biochemistry of protein folding, 3 op

**Voimassaolo:** 01.06.2011 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Lloyd Ruddock

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747602S Biochemistry of protein folding 2.5 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc., yr1-yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- present and discuss issues presented in the primary literature on a variety of aspects of protein folding.
- display an understanding of the theoretical and practical implications of *in vivo*, *in vitro* and *in silico* studies on protein folding and the integration of results.
- demonstrate the ability to interpret a wide range of data from multiple sources, to critically evaluate and contextualise this data and to solve problems relating to interpretation.

**Contents:**

This module provides an introduction to protein folding *in vivo*. Topics covered include protein folding and quality control in the endoplasmic reticulum, mechanisms regulating protein folding including the unfolded protein response, the catalysis of native disulphide bond formation, the biochemistry of molecular chaperones and the role of molecular chaperones and protein folding catalysts in other cellular events.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

16 contact hours of lectures and seminars

**Target group:**

M.Sc. in Protein science and biotechnology

**Prerequisites and co-requisites:**

Protein chemistry I (740364A) or Protein production and analysis (747601S) or equivalent

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

The module is assessed based on a report prepared on individual topics and on participation in the seminars.

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

**Grading:**

1-5/fail

**Person responsible:**

Lloyd Ruddock

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 747603S: Bioinformatics, 2,5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Ari-Pekka Kvist

**Opintokohteen kielet:** English

**ECTS Credits:**

2.5 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 spring

**Learning outcomes:**

Upon successful completion student are able to:

- use web-based bioinformatics tools.
- process the information and find solutions to various problems
- analyse and present the findings in the form of a report

**Contents:**

This course introduces basic concepts and methodology in bioinformatic research. Basic computational methods of DNA and protein handling and database searches are introduced. Other methods may include joining database and proteomic searches and evolutionary views of biocomputing. After this course a student has insight of basic methodology of bioinformatics.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

8 hr lectures, 30 h practicals. Attendance at practicals is obligatory.

**Target group:**

Major students

**Prerequisites and co-requisites:**

Basic course in statistics eg. Introduction to statistics (806113P, 5 credits) or Basic methods in statistics (806109P, 9 credits) is highly recommended.

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Exam

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

**Grading:**

1-5/fail

**Person responsible:**

Ari-Pekka Kvist

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 740148P: Biomolecules, 5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Tuomo Glumoff

**Opintokohteen kielet:** English

**Leikkaavuudet:**

ay740157P	Basic biochemistry 1: Biomolecules (OPEN UNI)	4.0 op
ay740152P	Basic biochemistry 1: Biomolecules (OPEN UNI)	5.0 op
740143P	Biomolecules for Biochemists	8.0 op
740147P	Biomolecules for Bioscientists	8.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

autumn-spring

**Learning outcomes:**

Upon successful completion students are able to:

- tell the composition, structure and function of the major groups of biomolecules in cells; nucleic acids, proteins, carbohydrates and lipids and describe the forces that modulate their function.
- apply information in the right context and evaluate it critically

**Contents:**

This module provides an overview of biochemistry, outlining the forces involved in biomolecule structure and the chemical structures and properties of polynucleic acids, proteins, carbohydrates and lipids. There will also be an



introduction to prebiotic evolution and a student debate on this subject. The module is arranged into lectures, workshops, a student debate. All of the exercises are in English. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

30 h lectures, plus exercises

**Target group:**

Minor subject students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Mathews, van Holde & Ahern: Biochemistry, (3rd edition) , published by Addison Wesley Longman, Inc. or equivalent

**Assessment methods and criteria:**

Continuous assessment, final examination

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

**Grading:**

1-5/fail

**Person responsible:**

Tuomo Glumoff

**Working life cooperation:**

No

**Other information:**

This module is the same as Biomolecules for Biochemists except that it contains no practical component. Location of instruction: Linnanmaa campus

## 740143P: Biomolecules for Biochemists, 8 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Tuomo Glumoff

**Opintokohteen kielet:** English

**Leikkaavuudet:**

ay740157P	Basic biochemistry 1: Biomolecules (OPEN UNI)	4.0 op
ay740152P	Basic biochemistry 1: Biomolecules (OPEN UNI)	5.0 op
740147P	Biomolecules for Bioscientists	8.0 op
740148P	Biomolecules	5.0 op

**ECTS Credits:**

8 credits

**Language of instruction:**

English

**Timing:**

B.Sc yr1 autumn-spring

**Learning outcomes:**

Upon successful completion students are able to:

- tell the composition, structure and function of the major groups of biomolecules in cells; nucleic acids, proteins, carbohydrates and lipids and describe the forces that modulate their function.
- apply information in the right context and evaluate it critically
- In addition, students on the 8op versions are able to work in the biochemical laboratory, are able to solve calculations and problems and are able to interpret the scientific data they generate.

**Contents:**

This module provides an overview of biochemistry, outlining the forces involved in biomolecule structure and the chemical structures and properties of polynucleic acids, proteins, carbohydrates and lipids. There will also be an

introduction to prebiotic evolution and a student debate on this subject. The module is arranged into lectures, workshops, a student debate and laboratory work. All of the exercises are in English. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

30 h lectures, 48 h lab., plus exercises

**Target group:**

Major students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Mathews, van Holde & Ahern: Biochemistry, (3rd edition), published by Addison Wesley Longman, Inc. or equivalent.

**Assessment methods and criteria:**

Continuous assessment, final examination

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

**Grading:**

1-5/fail

**Person responsible:**

Tuomo Glumoff

**Working life cooperation:**

No

**Other information:**

Location of instruction: lectures and computing at Linnanmaa campus, wet labs at Kontinkangas campus

## 743658S: Cell cycle, DNA replication and repair, 2,5 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Pospiech, Helmut

**Opintokohteen kielet:** English

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- explain why maintenance of genomic stability is required and how is it achieved?
- describe how DNA replication works and how is it studied
- describe how DNA damage is repaired
- summarize how DNA replication and repair is coordinated within the cell cycle, the DNA damage response and cell growth
- predict how DNA replication and repair is associated with disease and cancer

**Contents:**

The genetic information of all organisms is stored in the form of DNA. Since loss of DNA signifies loss of genetic information, DNA has to be maintained. This is in contrast to other biological macromolecules, which can be degraded and replaced by newly synthesised molecules. As a consequence, DNA has also to be copied faithfully during the process of DNA replication that precedes every cell division. Damage inflicted continuously to the DNA has to be repaired. Eucaryotic DNA replication, DNA repair and DNA damage response are tightly coordinated in the context of the cell cycles and the nuclear metabolism.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

16 h lectures

**Target group:**

MSc in molecular and cellular biology

**Prerequisites and co-requisites:**

B.Sc. in Biochemistry or Molecular Biology (or equivalent)

**Recommended optional programme components:**

-

**Recommended or required reading:**

Lecture handouts and review articles

**Assessment methods and criteria:**

Presence at the lectures compulsory, preparatory questions and homework

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

1-5/fail

**Person responsible:**

Helmut Pospiech

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**740366A: Cellular Communication, 6 op****Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Thomas Kietzmann**Opintokohteen kielet:** English**ECTS Credits:**

6 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr3 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- name, list and discuss the major intra- and intercellular signalling pathways
- present, describe and discuss characteristic features of signalling pathways
- describe how to study, examine and analyse signalling pathways

**Contents:**

The course covers basic aspects of the main cellular signalling pathways. The main emphasis will be made on the signalling pathways involved in the action of various hormones, growth factors, lipid-derived signaling molecules, and their cell surface and intracellular receptors, intracellular second messengers and protein kinases and phosphatases. The course involves a 40 h practical course (+written reports) in which cultured cells are used as targets to visualize certain hormone or drug-induced signaling molecules, their interactions, and how these regulate e.g. normal cell growth and/or cell death in culture. Attendance at practical course is obligatory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures, 32 h practicals

**Target group:**

Major students

**Prerequisites and co-requisites:**

Cellular biology

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Laboratory practicals, final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Thomas Kietzmann

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**747604S: Introduction to biocomputing, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** André Juffer

**Opintokohteen kielet:** English

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- discuss several biocomputing techniques
- decide which method to use under what circumstances
- judge the quality of an analysis of a given problem by means of biocomputing techniques

**Contents:**

An overview is given of commonly employed techniques of biocomputing to study the structural, dynamical, functional and thermodynamical properties of proteins and membranes and their interaction with other molecules. This will include a overview of computer simulation techniques such as molecular dynamics, Monte Carlo and Langevin (stochastic, Brownian) dynamics, but also concepts of continuum electrostatics, statistical thermodynamics, protein modeling techniques, protein-ligand affinity calculations and the computer simulation of the protein folding process and enzyme action. In addition, some topics in the field of Bioinformatics are discussed as well and certain commonly employed protein modeling software is introduced.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures, student tasks

**Target group:**

M.Sc. in Protein science and biotechnology

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Recommended books:

Leach, A.R., *Molecular modelling. Principles and applications*, Second edition, Prentice Hall, New York, 2001

Berendsen, H.J.C *Simulating the physical world. Hierarchical modeling from quantum mechanics to fluid dynamics.*

, Cambridge University Press, Cambridge, 2007

**Assessment methods and criteria:**

Presentation, group discussion

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

**Grading:**

pass/fail

**Person responsible:**

André Juffer

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 740379A: Introduction to immunology, 3 op

**Voimassaolo:** 01.08.2011 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Valerio Izzi

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

743660S	Introduction to immunology	3.0 op
740378A	Basic immunobiology for biochemists	3.0 op
741661S	Immunobiology	3.0 op
740369A	Immunobiology	3.0 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr3 autumn or M.Sc yr1-yr2 autumn

**Learning outcomes:**

After the course students will be able to identify, analyze and apply essential cellular molecules, components and mechanisms related to immunology, and complete their previous knowledge of molecular and cellular biology and protein chemistry with immunobiochemistry issues.

**Contents:**

The course handles both unspecific and specific immune response mechanisms, antibody structure and diversity, antibody-based immunodiagnosics, as well as basics of virus biochemistry.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

Lectures (12 h), a written home exercise, and a final exam.

**Target group:**

Major and minor subject undergraduates

**Prerequisites and co-requisites:**

Preliminary required courses: Molekyylibiologia I, Protein chemistry I and Solun biologia, or equivalent basic molecular biology, protein chemistry and cell biology studies.

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Home exercise, final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Valerio Izzi

**Working life cooperation:**

No

**Other information:**

This module is the same as 743660S Introduction to immunology. Location of instruction: Kontinkangas campus.

**747612S: Introduction to structure-based drug discovery, 4 op****Voimassaolo:** 01.01.2014 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Lari Lehtiö**Opintokohteen kielet:** English**Leikkaavuudet:**

747615S Introduction to structure-based drug discovery 5.0 op

**ECTS Credits:**

4 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-yr2 spring

**Learning outcomes:**

After completion of this course student should be able to:

- Find and analyze a protein structure of interest from databases from the point of view of drug discovery
- Critically assess a quality of an experimental protein-small molecule complex structure
- Discuss the process of creating a virtual small molecule library
- Describe the commonly used computational methods for screening of small molecule libraries against a protein target
- Critically judge the results of the computational screening

**Contents:**

The course will consist of assignments, lectures and a project work carried out during the course in study groups. Groups will present their project plans and the results. All students will give feedback and share ideas during the discussions. The project carried out during the course will be supported by lectures and discussions. The final mark comprises marks from continuous assessment, active participation to the group work and oral exam. Attendance to some parts of the course is compulsory. The course has limited enrollment for 24 students.

**Mode of delivery:**

Face to face and web based teaching

**Learning activities and teaching methods:**

Seminar days, practicals, group work, student presentations and discussions

**Target group:**

MSc in Protein science and biotechnology

**Prerequisites and co-requisites:**

BSc in biochemistry or a related subject, Protein Chemistry I or Protein production and analysis

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Continuous assessment, presentations, oral exam

**Grading:**

pass/fail

**Person responsible:**

Lari Lehtiö

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**740363A: Microbiology, 6 op****Opiskelumuoto:** Intermediate Studies**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Pospiech, Helmut

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

740374A	Microbiology	3.0 op
740322A	Microbiology	3.0 op
740324A	Laboratory course in microbiology	3.0 op

**ECTS Credits:**

6 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr1 spring

**Learning outcomes:**

Upon successful completion students are able to:

- define the typical features of bacteria, archaea, fungi and virus and explain the diversity of different groups of microorganisms
- explain the basic aspects of microbial metabolism
- understand the basics of microbial growth, enrichment, culture and growth control both in the environment and in contained culture
- explain the essential roles of microorganisms in our environment
- apply their knowledge for the growth and its control of standard laboratory microorganisms
- have a basic understanding of the industrial use of microorganisms or microbial compounds.

**Contents:**

This module is an introduction to general and applied microbiology and consists of lecture and laboratory exercises. In the lectures, the diversity and classification of microorganisms, especially bacteria will be introduced. Further topics are the structure and function of the prokaryotic cell, bacterial growth, metabolism and physiology, the importance of bacteria in different ecosystems as well as the industrial use of bacteria. The exercises introduce basic microbiological methods and techniques for the aseptic work. These include culture on solid and in liquid media, transfer of bacteria by streaking or spreading, the use of dilution and enrichment techniques, the inhibition of bacterial growth, measurement of bacterial growth and death, and finally the basics of transformation and bacteriophage infection and its use in molecular biology. Attendance at practical course is obligatory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

24 hours lecture and 60 hours laboratory exercises

**Target group:**

Major students

**Prerequisites and co-requisites:**

Biomolecules for Biochemists and Biochemical methodologies I

**Recommended optional programme components:**

-

**Recommended or required reading:**

M. Salkinoja-Salonen (ed.) (2002) Mikrobiologian perusteita, Helsingin yliopisto; Michael T. Madigan, John M. Martinko, Paul V. Dunlap, and David P. Clark Parker (2010) Brock biology of microorganisms, 12th ed. Prentice Hall International. Microbiology laboratory exercises, Dept. Biochemistry (2010).

**Assessment methods and criteria:**

Continuous assessment (home works, lab reports), final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Helmut Pospiech

**Working life cooperation:**

No

**Other information:**

Location of instruction: Lectures: Linnanmaa, laboratory: Kontinkangas

**740374A: Microbiology, 3 op****Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Pospiech, Helmut**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

740363A Microbiology 6.0 op

740322A Microbiology 3.0 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

spring

**Learning outcomes:****Learning outcomes:** Upon successful completion students are able to:

- define the typical features of bacteria, archaea, fungi and virus and explain the diversity of different groups of microorganisms
- explain the basic aspects of microbial metabolism
- understand the basics of microbial growth, enrichment, culture and growth control both in the environment and in contained culture
- explain the essential roles of microorganisms in our environment
- apply their knowledge for the growth and its control of standard laboratory microorganisms
- have a basic understanding of the industrial use of microorganisms or microbial compounds.

**Contents:**

This module is an introduction to general and applied microbiology and consists of lecture and laboratory exercises. In the lectures, the diversity and classification of micro organisms, especially bacteria will be introduced. Further topics are the structure and function of the prokaryotic cell, bacterial growth, metabolism and physiology, the importance of bacteria in different ecosystems as well as the industrial use of bacteria.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

24 h lectures

**Target group:**

Minor subject students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

M. Salkinoja-Salonen (toim.) (2002) Mikrobiologian perusteita, Helsingin yliopisto; M.T. Madigan, J. M. Martinko, J. Parker (2010) Brock biology of microorganisms, 13th ed. Prentice Hall International.

**Assessment methods and criteria:**

Continuous assessment (home works), final exam

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

1-5/fail

**Person responsible:**

Helmut Pospiech

**Working life cooperation:**

No

**Other information:**

This module is the same as Microbiology (740363A) except that it contains no practical component. Location of instruction: Linnanmaa campus



## 744621S: Molecular biology II, 3 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Elitsa Dimova

**Opintokohteen kielet:** English

### **ECTS Credits:**

3 credits

### **Language of instruction:**

English

### **Timing:**

M.Sc. yr1 autumn

### **Learning outcomes:**

After the course students are able to:

- discuss the general features of DNA manipulating/amplifying enzymes
- design (on paper or in silico) oligonucleotides for PCR amplification, set up restriction digests and ligation reactions in order to carry out basic and advanced cloning procedures
- use basic tools used in the genetic manipulation of mice

### **Contents:**

This module provides a “real-life” approach to practical molecular biology, including DNA cloning strategies, site directed mutagenesis, generation of transgenic mice, etc. It comprises concept overview lectures, but it is primarily based on complex problem solving based exercises including written reports and group student presentations, but does not include a final examination. The final mark comprises marks from continuous assessment. Attendance of the course is required.

### **Mode of delivery:**

Face to face teaching

### **Learning activities and teaching methods:**

12 h seminars, plus student presentations

### **Target group:**

Major students

### **Prerequisites and co-requisites:**

The course is designed for students familiar with DNA organization, gene structure & genetic concepts (ORF, codon, heterologous and homologous recombination).

### **Recommended optional programme components:**

-

### **Recommended or required reading:**

-

### **Assessment methods and criteria:**

Written report, student presentation

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

### **Grading:**

pass/fail

### **Person responsible:**

Elitsa Dimova

### **Working life cooperation:**

No

### **Other information:**

Location of instruction: Kontinkangas

## 743655S: Neurobiology, 4 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Heape Martin

**Opintokohteen kielet:** English

**ECTS Credits:**

4 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 spring

**Learning outcomes:**

The course is intended for students with little, or no prior education in the Neurosciences. At the end of the course, the students are able to:

- describe and define the general structural and functional organisation of the mammalian nervous system, and of the developmental and functional differentiation, and the roles of its cellular components.
- identify the selected areas of the neurosciences in which major research drives are currently undertaken.
- summarize a background knowledge of Neurobiology sufficiently to feel comfortable in undertaking a postgraduate research project in diverse fields of the Neurosciences.

**Contents:**

The course will focus mainly on the cell biology and biochemistry of cellular differentiation and function in the mammalian nervous system. Lectures cover: Embryology and structure of the mammalian nervous system - Cells and the extracellular environment in nervous tissues - Neuronal structure and function - Glial cells of the CNS and PNS - Functional and structural relationships between neurons and glia - Myelin synthesis, maintenance and function in the CNS and PNS - Cellular biochemistry of the transmission of the nervous impulse. The module includes an article analysis in small groups and presentation. Active participation and performance in article analysis exercises will contribute to the final mark.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

8-10 h lectures and 5-7 h group work (depending on number of students: maximum = 30 students).

**Target group:**

M.Sc./ Molecular and cellular biology

**Prerequisites and co-requisites:**

Biomolecules for Biochemists, Cellular Biology (740362A) or equivalent. In addition, the "Cellular communication" course (740366A) is a strong advantage, but not required.

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Presentation, Essay

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

**Grading:**

1-5/fail

**Person responsible:**

Anthony Heape

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 740145P: Physical Biochemistry, 6 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** André Juffer

**Opintokohteen kielet:** English

**ECTS Credits:**

6 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- define the relevance of theoretical concepts to the biosciences
- tell where various equations of physical biochemistry come from
- discuss the link between theory and experiment
- perform simple but realistic calculations

**Contents:**

This module will cover the concepts of thermodynamics and their application to biochemical systems plus chemical and enzymatic kinetics. Topics covered will include:

*Concepts of thermodynamics:* First, Second and Third Law of Thermodynamics. Heat. Work. Enthalpy. Entropy, Gibbs and Helmholtz free energy, Chemical potential, Chemical potential of a solute, Free energy and equilibrium.

*Applications of thermodynamics:* Chemical reactions, Protein-ligand association, Acids, bases and pH regulation, Acid-dissociation constants, introduction to thermodynamics of protein folding.

*Chemical kinetics:* Basic chemical reactions and single step reactions, Applications of chemical kinetics to multistep reactions, Catalysis and enzyme kinetics.

Attendance of some parts of the course is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

36 h le and exercises

**Target group:**

Major students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Recommended books:

Price NC *et al.*, *Principles and problems in Physical chemistry for Biochemists*, Third edition, Oxford University Press, Oxford, 2001.

Atkins P and De Paula J, *Physical chemistry*, 8ed, Oxford University Press, Oxford, 2006.

Atkins P and de Paula J. *Physical chemistry for the life science*, Oxford University Press, Oxford, 2006.

**Assessment methods and criteria:**

Homeworks, workshops, no exam

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

**Grading:**

1-5/fail

**Person responsible:**

André Juffer

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**740371A: Physiological Biochemistry, 4 op****Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Vasily Antonenkov**Opinto-kohteen oppimateriaali:****Murray, R.K.**, , 2006**Opinto-kohteen kielet:** English**Leikkaavuudet:**

742627S Physiological biochemistry 4.0 op

**ECTS Credits:**

4 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr3 spring

**Learning outcomes:**

Aim of the course is to get students familiar with :

- Specific aspects of human biochemistry
- Structure, tasks and function of different organs
- Systemic and intracellular regulation of metabolism
- Functional and regulatory relations of different organs

**Contents:**

Lectures include information about morphology, function and role in metabolism of adipose tissue, kidney, muscle tissue and cytoskeleton, alimentary system and liver. They also focus on structure of biomembranes, composition and function of endocrine system, hormone synthesis and signal transduction. Mechanisms of action of hormones (especially steroid hormones), their cell surface and intracellular receptors, second messengers and other regulatory molecules will be discussed.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

18 h lectures, 4 h seminars, and 10 h laboratory work. Seminars and laboratory work are compulsory.

**Target group:**

Major students

**Prerequisites and co-requisites:**

Basic biochemistry, cellular and molecular biology

**Recommended optional programme components:**

Alternative course: 751388A Animal physiology, lectures 4 op

**Recommended or required reading:**Murray et al. Harpers' Illustrated Biochemistry (28 or 29<sup>th</sup> edition)**Assessment methods and criteria:**

Final exam

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

1-5/fail

**Person responsible:**

Vasily Antonenkov

**Working life cooperation:**

No

**Other information:**

Recommended optional course. Location of instruction: Kontinkangas

**746606S: Project work in Biochemistry, 1,5 op****Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Lloyd Ruddock**Opintokohteen kielet:** English**ECTS Credits:**

1,5 credits

**Language of instruction:**

English

**Learning outcomes:**

Upon successful completion students are able to:

- apply scientific knowledge and methods to undertake scientific research with supervision

**Contents:**

Research work done in the Faculty of Biochemistry and Molecular Medicine or elsewhere which is not compensated in other courses. 40 hours of work gives 1.5 ECTS. The project work must be accepted beforehand and a report must be written and approved.

**Mode of delivery:**

Face to face teaching

**Target group:**

This module is meant for exchange students only

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Research work in the lab

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

**Grading:**

pass/fail

**Person responsible:**

Lloyd Ruddock

**Working life cooperation:**

Yes

**Other information:**

-

## 740364A: Protein Chemistry I, 8 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Martti Koski

**Opintokohteen kielet:** English

**ECTS Credits:**

8 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr2 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- tell the relevance of protein structure, including post-translational modification, to protein function
- describe the techniques available to purify proteins and to study protein function and have an appreciation of the applications and limitations of these techniques
- analyze a wide range of biochemical data and solve problems relating to the interpretation of data concerning protein function and basic structural characterization

**Contents:**

This module provides more detailed information on the chemistry of proteins. Topics covered include protein purification, reversible and irreversible covalent modifications of proteins, protein translocation, protein degradation, an introduction to the protein folding problem, protein structure analysis, basic enzyme catalysis mechanisms and co-enzymes. The module includes lectures, continuous assessments, group works, student presentations, and laboratory exercises. Final examination, lecture attendance/ continuous assessments, presentations and laboratory reports will all count towards the final mark. Attendance at laboratory exercises is obligatory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

30 h lectures, 80 h lab, exercises

**Target group:**

Major students

**Prerequisites and co-requisites:**

Biomolecules for Biochemists, Biochemical methodologies I

**Recommended optional programme components:**

-

**Recommended or required reading:**

Recommended reading": Greighton: Proteins, Structure and Molecular Properties, W.H. Freeman & Co, 2002 (2nd ed.)

**Assessment methods and criteria:**

Presentation, lab reports, final exam, attendance / continuous assessment  
Read more about [assessment criteria](#) at the University of Oulu webpage.

**Grading:**

1-5/fail

**Person responsible:**

Kristian Koski

**Working life cooperation:**

No

**Other information:**

Location of instruction: Lectures at Linnanmaa campus, laboratory exercises at Kontinkangas campus.

**744620S: Protein chemistry II, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Lari Lehtiö

**Opintokohteen kielet:** English

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1 autumn

**Learning outcomes:**

After the course, the students are able to:

- describe professional literature dealing with advanced techniques of protein analysis
- plan and implement the purification of a given protein on a large scale
- present and explain work related to protein purification and analysis

**Contents:**

This module provides a "real-life" approach to practical protein chemistry, including purification, biophysical analysis, enzymatics, etc. It comprises a small number of revision lectures, but it is primarily based on problem solving based exercises with a further level of complexity built in compared with Protein Chemistry I. The module includes a student presentation, but does not include a final examination. The final mark comprises marks from continuous assessment. Attendance of some parts of the course is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

12 h seminars, plus exercises and a student report

**Target group:**

Major students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Continuous assessment, presentation

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

**Grading:**

Pass/fail

**Person responsible:**

Lari Lehtiö ja Teemu Haikarainen

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 747601S: Protein production and analysis, 8 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Lloyd Ruddock

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747618S Protein production and analysis 10.0 op

**ECTS Credits:**

8 credits

**Language of instruction:**

English

**Timing:**

Int M.Sc. yr1 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- tell and discuss the relevance of protein structure, including post-translational modification, to protein function
- assess the techniques available to purify proteins and to study protein function and an appreciation of the applications and limitations of these techniques
- interpret a wide range of biochemical data and to solve problems relating to the interpretation of data relating to protein function and basic structural characterization

**Contents:**

This module provides an overview of recombinant protein production and analysis. Topics covered include an overview of DNA technology, PCR, cloning, mutagenesis, protein production, purification, enzyme catalysis, protein structure analysis, basic proteomics and mass spectrometry. This course covers some of the material taught in Protein Chemistry I (740364A) and Molekyylibiologia I (740361A) and therefore cannot be taken by students who have either of these modules.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

46 contact hours of lectures and seminars, 80 hours of lab

**Target group:**

Int MSc in Prot Sci

**Prerequisites and co-requisites:**

A BSc in biochemistry or a closely related subject.

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Continuous assessment (problem solving exercises, lab reports)

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

**Grading:**

1-5/fail

**Person responsible:**

Lloyd Ruddock

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**747606S: Structural enzymology, 3 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Wierenga Rikkert

**Opintokohteen kielet:** English

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- discuss the methods that are used to crystallize proteins
- describe the basic concepts of the transition state theory
- define the relation between reaction rates and free energy barriers
- describe enzyme reaction mechanisms
- describe the concepts of catalytic bases and acids
- illustrate active site strain
- tell the importance of active site electrostatics
- describe the concept of transition state analogues

**Contents:**

General and specific aspects of the reaction mechanism of several well studied enzymes will be discussed. It will include the serine proteases (such as chymotrypsin and trypsin). The following topics will be addressed: Chemical catalysis, transition state theory, forces stabilizing the enzyme-ligand interaction, structural properties of proteins, enzyme kinetics, crystallization of proteins, general aspects of enzyme catalysed reactions, reaction mechanisms of serine proteases, transition state analogues. The course is aimed at biochemistry and chemistry students.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures and seminars

**Target group:**

M.Sc. in Protein science and biotechnology

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Oral presentation

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

**Grading:**

pass/fail

**Person responsible:**

Rikkert Wierenga

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

**744619S: Systems biology, 4 op**



**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Gonghong Wei

**Opintokohteen kielet:** English

**ECTS Credits:**

4 credits

**Language of instruction:**

English

**Timing:**

M.Sc. 1st-2nd autumn

**Learning outcomes:**

After the course student is able to define the cell as an ensemble of structural and functional parts. He is also able to connect and describe their current knowledge on cellular, molecular and structural biology into a general view. The student is also able to assess scientific information critically on novel research findings and the problems associated with massive amounts of novel scientific information.

**Contents:**

The module aims to give a holistic picture of the cell as a system. Cells contain numerous molecules and complex structures that interact with each other to form complex interaction networks such that when taken together they form a new whole, which cannot be understood by just investigating the parts. Methods to collect and assemble biological/biochemical information for systems analysis will be introduced. Possibilities of systems approach will be critically discussed in relation to available research techniques, techniques of the future, applications, research targets, as well as from the philosophical and ethical point of view including applicability of the systems theory in biosciences.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

The module consists of 22 h of lectures, discussions and case studies, ca. 5h of computing exercises

**Target group:**

Major students

**Prerequisites and co-requisites:**

B.Sc. in biochemistry or a related subject or otherwise adequate knowledge on cellular, molecular and structural biology.

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Study diaries will be assessed for a mark on scale 1 to 5 upon request. Otherwise marking will be Pass/fail. There is no exam and thus presence on certain amount of the course is compulsory.

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

**Grading:**

1-5/fail

**Person responsible:**

Gonghong Wei

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 743657S: Tumor cell biology, 3 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Thomas Kietzmann

**Opintokohteen kielet:** English

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- name, list and discuss the major aspects including formation of a tumor cell
- present, describe and discuss characteristic aspects of oncogenes and tumor suppressor genes
- use methods to study, examine and to analyse tumor genesis and tumor progression

**Contents:**

The course covers basic aspects of the main pathways inducing formation of a tumor. The main emphasis will be made on the formation of oncogenes, the action of tumor suppressor genes and the induction of tumors by viruses.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures

**Target group:**

MSc / Molecular and cellular biology

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Thomas Kietzmann

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 740380A: Virology, 3 op

**Voimassaolo:** 01.08.2012 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Thomas Kietzmann

**Opintokohteen kielet:** English

**Leikkaavuudet:**

743661S Virology 3.0 op

**ECTS Credits:**

3 credits

**Language of instruction:**

English

**Timing:**

BSc. yr3 spring

**Learning outcomes:**

Upon successful completion students are able to:

- discuss the major groups of viruses and their infection and replication mechanisms
- present and discuss characteristic features of specific viruses and their relation to pathogenesis and immunity
- describe diagnostic methods and antiviral therapy

**Contents:**

The course covers basic aspects of virology. The main emphasis will be made on viral infection, replication, transcription, proteinsynthesis, virological diagnostics, infection kinetics, defense against viruses, ways of infection, vaccination, and antiviral therapy. The course involves lectures 10h and 10h seminars where the students should be able to recapitulate major aspects of the taught material in 5-7 min presentations.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

24 h lectures and student presentations in seminars

**Target group:**

Major students

**Prerequisites and co-requisites:**

Cellular biology

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Thomas Kietzmann

**Working life cooperation:**

No

**Other information:**

This module is the same as Virology (743661S). Location of instruction: Kontinkangas

**744623S: Yeast genetics, 6 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine

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

**Opettajat:** Alexander Kastaniotis

**Opintokohteen kielet:** English

**Leikkaavuudet:**

744616S Yeast genetics and molecular biology 2.5 op

744613S Yeast genetics 1.5 op

**ECTS Credits:**

3-6 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1-yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- tell a basic knowledge of yeast genetics and physiology
- tell the basic principles of using the yeast model organism to address fundamental genetic and cell biological problems

- (practical course) describe variety of genetic and molecular biology techniques commonly used to manipulate baker's yeast in the pursuit of biological questions

**Contents:**

This course is an introduction to *Saccharomyces cerevisiae* as a model organism and the use of classical and molecular genetic approaches in this yeast to study basic cellular processes. We will also focus on genetic screens and selections designed to identify targets of interest. Aspects of transcriptional regulation will be discussed to provide a basic understanding for some of the screens and selections introduced. The lecture part is open to all students that fulfill the enrollment requirements, and equals 3 op. Performance in the course will be assessed by participation in the course review session at the beginning of each lecture (10% of total grade) and by a final written examination. The practical part of this is a block practical spread over two weeks (2 days – 3 days – 2 days – 3 days) running almost parallel to lecture course. It is designed to provide training in techniques and concepts commonly used in yeast genetics (streaking, spotting, mating, tetrad analysis, transformation, colony-color based assays, carbon source-dependent expression of genes, as well as generation and cloning of mutants). This part of the course has limited enrollment for 16 people.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

16 h lectures, 10 days practical, final exam and oral participation in course review session

**Target group:**

Major students

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

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**Assessment methods and criteria:**

Course review sessions, final exam, experiment reports

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

**Grading:**

1-5/fail

**Person responsible:**

Alexander Kastaniotis

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus