

# Opasraportti

## FBMM - Courses in English for exchange students, Biochemistry (2018 - 2019)

### Courses in English for exchange students at the Faculty of Biochemistry and Molecular Medicine

This Course Catalogue lists courses taught in English that are available for exchange students at the Faculty of Biochemistry and Molecular Medicine during academic year 2018-19.

When preparing your study plan please use the information provided under the Courses tab in this catalogue. 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, additional information containing LOCATION OF INSTRUCTION (Kontinkangas campus / Linnanmaa campus).

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

Please notice that in some courses lectures will be given in Finnish but laboratory part is possible to take in English (Biochemical methodologies I, Molecular biology I, Metabolism I).

Please notice that in some courses the number of students is restricted (see "Additional data in the course catalogue FBMM..."). In these courses degree students have the privilege and possibility for exchange students to participate will be decided only some weeks before a course will start.

For information on the exchange application process please see [www oulu.fi/university/studentexchange](http://www oulu.fi/university/studentexchange). All exchange applicants must submit their exchange application through SoleMOVE by the deadline given, proposed study plan is attached to the on-line application.

Accepted exchange students are required to register to all courses. Course registration takes place once you have received your University of Oulu login information, this takes place close to the start of your exchange period. When registering you will be able to find detailed information on teaching and schedule under Instruction tab.

In order to participate courses You should have enough background knowledge (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). For example 10 full weeks in a research work gives You 15 ECTS.

Teaching periods for 2018-19

Autumn term 2018

Period 1: Sept 3 - Oct 26, 2018

Period 2: Oct 29 – Dec 21, 2018

Spring term 2019

Period 3: Jan 7 – March 8, 2019  
 Period 4: March 11 – May 10, 2019

For arrival and orientation dates see [www oulu.fi/university/studentexchange/academic-calender](http://www oulu.fi/university/studentexchange/academic-calender)

Any questions on courses at the Faculty of Biochemistry and Molecular Medicine

should be addressed to:

Jari Heikkinen  
[study.fbmm@oulu.fi](mailto:study.fbmm@oulu.fi)

Further information on application process and services for incoming exchange students:  
[www oulu.fi/university/studentexchange](http://www oulu.fi/university/studentexchange) or [international.office@oulu.fi](mailto:international.office@oulu.fi)

## Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

740381A: Biochemical and biomedical innovation, 2 - 5 op  
 740151P: Biochemical methodologies I, 10 op  
 747616S: Biochemical methodologies II, 10 op  
 747617S: Biochemistry and biotechnology of protein folding, 5 op  
 740148P: Biomolecules, 5 op  
 740147P: Biomolecules for Bioscientists, 8 op  
 740362A: Cellular Biology, 6 op  
 740366A: Cellular Communication, 6 op  
 743663S: Developmental biology, stem cells and tissue engineering, 5 op  
 743662S: Extracellular matrix, 5 op  
 743664S: Hypoxia response pathway - molecular mechanisms and medical applications, 5 op  
 747613S: In silico methodologies in biochemistry and molecular medicine, 5 op  
 740384A: Introduction to immunology, 5 op  
 747615S: Introduction to structure-based drug discovery, 5 op  
 747614S: Macromolecular X-ray crystallography, 5 op  
 740146P: Metabolism I, 6 op  
 740363A: Microbiology, 6 op  
 740374A: Microbiology, 3 op  
 740361A: Molecular Biology I, 8 op  
 744627S: Molecular biology II, 5 op  
 743665S: Molecular, cell biological and genetic aspects of diseases, 5 op  
 740145P: Physical Biochemistry, 6 op  
 740386A: Physiological biochemistry, 5 op  
 746606S: Project work in Biochemistry, 1,5 op  
 740364A: Protein Chemistry I, 8 op  
 744626S: Protein chemistry II, 5 op  
 747618S: Protein production and analysis, 10 op  
 744630S: Systems biology, 5 op  
 743668S: Tumor cell biology, 5 op  
 740385A: Virology, 5 op  
 744632S: Yeast genetics, 5 op

## Opintojaksojen kuvaukset

## Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

### 740381A: Biochemical and biomedical innovation, 2 - 5 op

**Voimassaolo:** 01.08.2016 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

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

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

**Opettajat:** Lloyd Ruddock

**Opintokohteen kielet:** English

**ECTS Credits:**

2-5 credits

**Language of instruction:**

English

**Timing:**

Can be taken by any BSc / MSc / PhD student

**Learning outcomes:**

The aim of the course is to get student familiar with:

- the core skill set required to recognize opportunities/needs and how to validate creative ideas
- the core skill set of searching patent databases
- the concepts of intellectual property rights (IPR)
- the concepts of how to pitch an idea

**Contents:**

This module covers basic aspects of the key skills required for successful innovation in the field of biochemistry and molecular medicine. Concepts relating to how to recognize opportunities, how to recognize what is needed in the field, creative thinking, validating ideas and how to pitch ideas are covered as well as an introduction to intellectual property rights and patent searching. In addition to workshops/seminars (19 hours) the 5 ECTS version of course requires submission of an invention disclosure/proof of concept funding or submission of an entry to the biochemistry and molecular medicine innovation award.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

19 hours of lectures/workshops

**Target group:**

Major students

**Prerequisites and co-requisites:**

None

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

For 2 ECTS participation in at least 70% of seminars/workshops. For 5 ECTS participation in at least 70% of the seminars/workshops plus submission of an invention disclosure / proof of concept funding application to the university (PhD students) or submission of an entry to the biochemistry and molecular medicine innovation award (BSc and MSc students).

**Grading:**

Pass/fail

**Person responsible:**

Lloyd Ruddock

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas campus

## 740151P: Biochemical methodologies I, 10 op

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Basic Studies

**Laji:** Course

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

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

**Opettajat:** Sakari Kellokumpu

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay740153P	Basic biochemistry 2: Methods (OPEN UNI)	2.0 op
ay740144P	Biochemical Methodologies I (OPEN UNI)	8.0 op
740144P	Biochemical Methodologies I	8.0 op

**Voidaan suorittaa useasti:** Kyllä

### ECTS Credits:

10 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 and present experiments and results in the laboratory and other works

### 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, principals 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. In addition transferable skills like word processing (Microsoft Word) and spreadsheet (Microsoft Excel), drawing of curve charts, the basics of oral presentation, ethics in scientific research and good scientific practice are involved.

### Mode of delivery:

Face to face teaching

### Learning activities and teaching methods:

34 h lectures and exercises, 120 h lab. Laboratory work is compulsory. It is possible to complete lecture part only (3.5 ECTS).

### Target group:

Major students

### Prerequisites and co-requisites:

Biomolecules, Biomolecules for Biochemists tai Biomolecules for Bioscientists

### Recommended optional programme components:

-

### Recommended or required reading:

Recommended reading: Reed, Holmes, Weyers & Jones: Practical skills in biomolecular sciences, 4th edition, Pearson, 2013.

You can check the availability of the course books via [this link](#)

### Assessment methods and criteria:

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

### Grading:

1-5/fail

### Person responsible:

Sakari Kellokumpu

**Working life cooperation:**

No

**Other information:**

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

**747616S: Biochemical methodologies II, 10 op****Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Ulrich Bergmann**Opintokohteen kielet:** English**Leikkaavuudet:**

747608S Biochemical methodologies II 8.0 op

**ECTS Credits:**

10 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. The course has limited enrollment for 22 students.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

120 h lab., including pre-lab lectures plus exercises. For laboratory period a personal time table will be created for every student. Each student will spend about 1 full day and 5 half day's slots in the lab, plus one week proteomics lab with workload from 2h to full day.

**Target group:**

Obligatory for M.Sc. in Protein Science and biotechnology

**Prerequisites and co-requisites:**

Protein production and analysis (747618S) 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

## 747617S: Biochemistry and biotechnology of protein folding, 5 op

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Lloyd Ruddock

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747611S Biochemistry of protein folding 3.0 op

### ECTS Credits:

5 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 contextualize this data and to solve problems relating to interpretation.

### Contents:

This module provides an introduction to protein folding in vivo and in vitro. 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. The application of this knowledge to biotechnology will also be discussed.

### 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 and exchange students

### Prerequisites and co-requisites:

Protein chemistry I (740364A) or Protein production and analysis (747618S) or equivalent

### Recommended optional programme components:

-

### Recommended or required reading:

-

### Assessment methods and criteria:

The module is assessed based on reports 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

## 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 and Finnish

**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 and workshops. 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, exchange 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

## 740147P: Biomolecules for Bioscientists, 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
740143P	Biomolecules for Biochemists	8.0 op
740148P	Biomolecules	5.0 op

**ECTS Credits:**

8 credits

**Language of instruction:**

English and Finnish

**Timing:**

Course starts in autumn term and will continue to spring term

**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:**

Minor subject students, exchange 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. Location of instruction: Lectures: Linnanmaa, laboratory: Kontinkangas

## 740362A: Cellular Biology, 6 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course



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

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

**Opettajat:** Sakari Kellokumpu

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

740323A Cell culture course 3.0 op

744610S Advanced course for cell biology 3.0 op

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

B.Sc. yr2 spring

**Learning outcomes:**

Upon successful completion students are able to:

- interpret and analyze the general molecular mechanisms of cell functions
- plan how such molecular mechanisms can be studied in vitro and in vivo
- track the molecular defects that might be responsible for abnormal functioning of cells e.g. in disease states

**Contents:**

The aim of the course is to deepen the knowledge about where in the cell different biochemical reactions take place, how the molecules are trafficked between organelles, and how these phenomena can be studied in cultured cells. The course aims to address specifically the specific functions of the organelles in an eukaryotic cell, transport of material into and out of the cells, and how the cytoskeleton serves many of these functions. The course contains practical lab work, during which the students learn basic skills on cell culture and fluorescence microscopy. The practical course is compulsory for the Biochemistry students.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

24 h lectures, 40 h lab

**Target group:**

Major students

**Prerequisites and co-requisites:**

Cell biology, Biomolecules for biochemists, Biochemical methodologies I

**Recommended optional programme components:**

-

**Recommended or required reading:**

Lodish, et al., Molecular Cell Biology (partly), 4th edition. W.H. Freeman and Company

**Assessment methods and criteria:**

Lab reports, final exam

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

**Grading:**

1-5/fail

**Person responsible:**

Sakari Kellokumpu

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 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

**743663S: Developmental biology, stem cells and tissue engineering, 5 op****Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Vainio Seppo, Aleksandra Rak-Raszewska**Opintokohteen kielet:** English**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 spring

**Learning outcomes:**

Upon completion of the course the student have obtained an overview of how the development of tissues and organs is regulated and executed via developmental gene regulation and developmental programs behind

morphogenesis. Students will become familiar with the classical and modern experimental embryological techniques during lectures and also with hands-on laboratory work.

**Contents:**

The course provides knowledge on use of various model organisms, basic information about embryology and early developmental mechanisms and signaling molecules. Introduces detailed description of development of few organ systems and provides knowledge about classical and novel study techniques to discover new developmental ques. The course has limited enrollment for 16 students. Lecture part (2 credits) is open for all students.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

16 h lectures and seminars, 3 assessments and 25 h laboratory work. Lectures (100% attendance), assessments and laboratory work are compulsory.

**Target group:**

MSc / Molecular medicine

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

-

**Assessment methods and criteria:**

Continuous assessment, no exam

**Grading:**

1-5/fail

**Person responsible:**

Seppo Vainio and Aleksandra Rak-Raszewska

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 743662S: Extracellular matrix, 5 op

**Voimassaolo:** 01.08.2015 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Heljasvaara, Ritva-Leena

**Opintokohteen kielet:** English

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 autumn

**Learning outcomes:**

Upon successful completion students are able to:

- Describe the structure and key components of the mammalian ECM
- Describe the main significance of the ECM for cell and tissue function
- Outline the roles of ECM in inherited connective tissue disorders and in common other diseases
- Identify connective tissue and some of its components in tissue samples using various staining protocols (laboratory work).
- Summarize background knowledge of ECM sufficiently to feel comfortable in undertaking a postgraduate research project in the ECM field

**Contents:**

Besides including basic background knowledge on the ECM, the course will highlight the ECM-related topics that are currently being investigated at the Faculty of Biochemistry and Molecular Medicine. Orientation to mouse and cell models of ECM molecules will form a crucial part in teaching.

Contents of lectures in 2018: Collagens and collagen-related hereditary diseases; Proteoglycans and glycoproteins; Basement membranes; Pericellular matrix of the vasculature; Integrins and other ECM receptors; Matricellular proteins; Elastic fibres; ECM plasticity and remodeling; ECM degrading enzymes; Stem cell microenvironments; ECM in fibrosis and cancer. The course has limited enrollment for 28 students.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

23 h lectures, 6 h seminars, and 36 h laboratory work. Seminars and laboratory work are compulsory

**Target group:**

MSc / Molecular medicine

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

**Extracellular Matrix Biology** Eds. Richard O. Hynes and Kenneth M. Yamada, 2011. Cold Spring Harbor Perspectives in Biology

[http://cshperspectives.cshlp.org/site/misc/extracellular\\_matrix\\_biology.xhtml](http://cshperspectives.cshlp.org/site/misc/extracellular_matrix_biology.xhtml)

**Assessment methods and criteria:**

Continuous assessment, final exam

**Grading:**

1-5/fail

**Person responsible:**

Ritva Heljasvaara

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 743664S: Hypoxia response pathway - molecular mechanisms and medical applications, 5 op

**Voimassaolo:** 01.03.2016 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Karppinen, Peppi Leena Elina

**Opintokohteen kielet:** English

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 autumn

**Learning outcomes:**

Upon completion the student should be able to:

- Present and discuss the basic mechanisms involved in regulation of oxygen homeostasis on cellular, tissue, organ/organism level
- To integrate/adapt regulation of oxygen homeostasis under normal physiological conditions to pathological situations
- Display an understanding on how the basic biochemical knowledge translates from the bench to the bedside
- Understand the meaning of translational research

**Contents:**

General physiology of hypoxia, Hypoxia response in bacteria, Hypoxia response in yeast, Hypoxia-inducible factors (HIFs), Regulation of HIFs on the transcriptional, translational and post-translational level, Conditions related to hypoxia response (erythropoiesis and iron regulation, angiogenesis and metabolism), Experimental models to study hypoxia, HIFs and HIF prolyl 4-hydroxylases as drug targets. Lecture topics may vary.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

14 h lectures, 22 h seminars (obligatory) and 4 h round table discussions.

**Target group:**

MSc / Molecular medicine

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Lecture notes, student seminar presentations, research articles.

**Assessment methods and criteria:**

Seminars and exam. 1/5 of the grade is based on the seminar presentation and opponent work and 4/5 on the exam in which the student must display an understanding on how the basic biochemical knowledge translates from the bench to the bedside.

**Grading:**

1-5/fail

**Person responsible:**

Peppi Karppinen

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

## 747613S: In silico methodologies in biochemistry and molecular medicine, 5 op

**Voimassaolo:** 01.08.2016 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** André Juffer

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747603S Bioinformatics 2.5 op

747604S Introduction to biocomputing 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 spring

**Learning outcomes:**

After a successful completion of this course, students will have

- Obtained an appreciation of the quantitative aspects of analyzing scientific (big) data either stored in large data databases or generated by sophisticated modeling and simulation tools.
- Gained a basic understanding of applying various bioinformatics methods to large biological data sets.
- Realized the potential of scientific computing for the study of the behavior of biological systems, in particular large biological macromolecules.

**Contents:**

This course aims at emphasizing the quantitative aspects of scientific research. For this, the course contains three intertwined components: (i) searching and evaluating nucleic acid and protein structural data from various databases, (ii) use of scientific computing to study structural, dynamical, functional and thermodynamical properties of proteins and membranes and their interaction with other molecules, and (iii) using biocomputing tools to access and analyze large and high-throughput data produced and accessible through biochemical and computational experiments.

Students will learn to access biological databases, search and retrieve relevant data, analyze data in a meaningful manner, and link data and results obtained from different tools. A very brief introduction to metabases and data compilation is provided as well. Interaction studies are emphasized through genome-wide mapping of protein-

DNA interaction, proteomics-based bioinformatics, and high-throughput mapping of protein-protein interaction networks. Commonly employed modeling and simulation techniques will also be dealt with. These include molecular dynamics, Monte Carlo and Langevin (stochastic, Brownian) dynamics, continuum electrostatics, statistical thermodynamics, protein modeling techniques, protein-ligand docking, protein-ligand affinity calculations and the computer simulation of the protein folding process and enzyme action.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

74 h contact sessions. Lectures and practicals, student tasks, including the presentation of an original article. Attendance to practicals and article presentation are mandatory.

**Target group:**

MSc / Protein science and biotechnology

**Prerequisites and co-requisites:**

-

**Recommended optional programme components:**

-

**Recommended or required reading:**

Books, articles:

1. Big data in biomedicine (<http://www.nature.com/nature/outlook/big-data/>)
2. Holzinger, A. Biomedical informatics, Springer, Heidelberg, 2014.
3. PubMed (Publications) (<http://www.ncbi.nlm.nih.gov/pubmed/>)
4. Leach, A.R., Molecular modelling. Principles and applications, Second edition, Prentice Hall, New York, 2001
5. Berendsen, H.J.C Simulating the physical world. Hierarchical modeling from quantum mechanics to fluid dynamics., Cambridge University Press, Cambridge, 2007

Useful databases:

1. GenBank (DNA) (<http://www.ncbi.nlm.nih.gov/nucleotide>)
2. Ensembl and Ensembl Genomes (Genome) (<http://www.ensembl.org/> and <http://ensemblgenomes.org/>)
3. UniProt (Protein) (<http://www.uniprot.org/>)
4. DIP and BioGrid (Protein Interaction) (<http://dip.doe-mbi.ucla.edu/dip/Main.cgi> and <http://thebiogrid.org/>)
5. PDB (protein structure database) (<http://www.rcsb.org/>)
6. Entrez (<http://www.ncbi.nlm.nih.gov/gquery/gquery.fcgi>)

**Assessment methods and criteria:**

Practicals evaluation, article presentation, group discussion, and project report. No exam.

**Grading:**

pass/fail

**Person responsible:**

André H. Juffer

**Working life cooperation:**

no

**Other information:**

Location of instruction: Kontinkangas campus

## 740384A: Introduction to immunology, 5 op

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

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

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

**Opettajat:** Zhi Chen

**Opintokohteen kielet:** English

**Leikkaavuudet:**

740379A Introduction to immunology 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

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

**Learning outcomes:**

After the course students will be able to understand, identify, analyze and apply essential concepts of cellular and molecular components and mechanisms of immunology, and integrate their previous knowledge of molecular and cellular biology and protein chemistry with immunology and immunobiochemistry instances

**Contents:**

The course handles the basis of immunology, covering cells and mechanisms of innate and adaptive immune responses (inflammation, anti-microbial and anti-viral defenses, T-cell activation, antibody production, etc.). The course also offers insights into the physiopathology of the immune responses (chronic inflammation, allergy, autoimmune disorders, transplantation and cancer) and the clinical (immunotherapy, cytokine therapy, etc.) and industrial (monoclonal antibodies, ELISA and immunodiagnostics, etc.) applications of immunological processes.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

Lectures (14 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 Cellular biology, 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 743666S Introduction to immunology. Location of instruction: Kontinkangas campus.

## 747615S: Introduction to structure-based drug discovery, 5 op

**Voimassaolo:** 01.08.2016 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Lari Lehtiö

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747612S Introduction to structure-based drug discovery 4.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 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 20 students.

**Mode of delivery:**

Face to face and web based teaching

**Learning activities and teaching methods:**

12 h Lectures, 48 h practicals and group work, 9 h student presentations and discussions

**Target group:**

MSc / 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:**

1-5/fail

**Person responsible:**

Lari Lehtiö

**Working life cooperation:**

no

**Other information:**

Location of instruction: Kontinkangas campus

**747614S: Macromolecular X-ray crystallography, 5 op**

**Voimassaolo:** 01.08.2016 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Lari Lehtiö, Wierenga Rikkert

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747605S Basic aspects of protein crystallographic methods 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 autumn

**Learning outcomes:**

After completion of this course students are able to:

- Discuss the key aspects of protein crystallization methods and interpret the results
- Describe the diffraction of X-rays and the importance of crystal symmetry
- Describe the importance of the Fourier transform method in the structure determination
- Describe the phase problem and tell the methods to solve it
- Apply knowledge on protein chemistry to refinement of a crystal structure
- Judge the quality of a protein structure

**Contents:**



The course will describe the principles of X-ray diffraction theory and practice. It includes a hands on project done throughout the course on protein crystallization, data collection, solving and refinement of the protein structure and validation of the model. Following topics will be covered during the lectures and practicals: crystallisation theory, symmetry of crystals, handling of crystals, data collection, diffraction pattern and the reciprocal lattice, the phase problem, molecular replacement, isomorphous and anomalous differences, structure refinement and validation. Attendance to the lectures and exercises is compulsory. The course has limited enrollment for 18 students

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

35 h lectures, 52 h exercises, project work and a research report

**Target group:**

MSc / Protein science and biotechnology

**Prerequisites and co-requisites:**

Protein chemistry I or Protein production and analysis or equivalent

**Recommended optional programme components:**

-

**Recommended or required reading:**

Rupp, B: Biomolecular Crystallography: Principles, Practice and Application to Structural Biology

Blow, D: Outline of Crystallography for Biologists (eBook available)

Drenth, J: Principles of Protein X-Ray Crystallography

**Assessment methods and criteria:**

Continuous assessment, research report, no exam.

**Grading:**

pass/fail

**Person responsible:**

Lari Lehtiö and Rikkert Wierenga

**Working life cooperation:**

no

**Other information:**

Location of instruction: Kontinkangas campus

## 740146P: Metabolism I, 6 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

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

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

**Opettajat:** Tuomo Glumoff

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay740158P Basic biochemistry 3: Metabolis (OPEN UNI) 4.0 op

ay740154P Basic biochemistry 3: Metabolis (OPEN UNI) 3.0 op

740149P Metabolism I 4.0 op

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

B.Sc. yr1 spring

**Learning outcomes:**

Students will be able to explain the main principles of how the metabolism is made up, will get a detailed picture of the energy metabolism, and will be able to organize part of the wholeness of metabolism, particularly how energy metabolism is networked to the synthesis and degradation of biomolecules.

**Contents:**

On this course the central concepts and mechanisms of metabolism, its regulation and the integration of metabolic pathways will be introduced, like anabolism and catabolism, linking of different pathways, and metabolic

regulation. Especially the energy metabolism will be studied, concerning carbohydrates, lipids and the respiratory chain. Combined with the course Metabolism II the students will get a good overview on the principles of metabolism, metabolic integration and the methods to study metabolism.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

Lectures (28 h), problem-based exercises (workshops) 6 h, laboratory work (32 h, attendance obligatory), lab diary and final exam.

**Target group:**

Major subject students

**Prerequisites and co-requisites:**

Biomolecules, Biomolecules for Biochemists or Biomolecules for Bioscientists

**Recommended optional programme components:**

Biomolecules, Biomolecules for Biochemists tai Biomolecules for Bioscientists

**Recommended or required reading:**

-

**Assessment methods and criteria:**

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

**Grading:**

1-5/fail. Problem-based exercises, laboratory work and a final exam will count towards the final grade.

**Person responsible:**

Tuomo Glumoff

**Working life cooperation:**

No

**Other information:**

Location of instruction: Lectures: Linnanmaa, laboratory: Kontinkangas

## 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

**740361A: Molecular Biology I, 8 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

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

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

**Opettajat:** Mirva Saaranen

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

740373A Molecular Biology I 4.0 op

740318A Molecular Biology 4.0 op

740337A Laboratory Course in Molecular Biology 3.0 op

**ECTS Credits:**

8 credits

**Language of instruction:**

Finnish and English

**Timing:**

B.Sc. yr2 autumn

**Learning outcomes:**

After this course students should understand the basics of molecular biology and be able to use modern molecular biology methods.

**Contents:**

The course covers gene structure, DNA replication, recombination, transcription, translation and basics of gene expression. The student will learn the most common recombinant DNA techniques, such as PCR, use of restriction endonucleases, preparation of recombinant plasmids and DNA sequencing. Attendance of some parts is compulsory.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

20 h lectures, 4 h computer exercise, 80 h lab, homeworks. Laboratory and computer practicals are compulsory

**Target group:**

Major subject students

**Prerequisites and co-requisites:**

Cellular biology, Biomolecules for Biochemists and Biochemical methodologies I

**Recommended optional programme components:**

-

**Recommended or required reading:**

Mathews, CK, van Holde KT, Applins DR, Anthony-Cahill SJ: Biochemistry (4th edition). Optional.

**Assessment methods and criteria:**

Homeworks 40 %, lab reports 20 % and final exam 40 %.

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

**Grading:**

1-5/fail.

**Person responsible:**

Mirva Saaranen and Aki Manninen

**Working life cooperation:**

No

**Other information:**

Location of instruction: Lectures: Linnanmaa, laboratory: Kontinkangas

**744627S: Molecular biology II, 5 op**

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Elitsa Dimova

Opintokohteen kielet: English

Leikkaavuudet:

744621S Molecular biology II 3.0 op

**ECTS Credits:**

5 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:**

18 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. No exam.

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

## 743665S: Molecular, cell biological and genetic aspects of diseases, 5 op

**Voimassaolo:** 01.08.2016 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Valerio Izzi

**Opintokohteen kielet:** English

**Leikkaavuudet:**

740396A Molecular, cell biological and genetic aspects of diseases 5.0 op

743659S Biochemistry of cell organelles 3.0 op

743604S Biochemistry of inherited diseases 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

MSc yr1-2 autumn

**Learning outcomes:**

Upon completion the student should be able to:

- based on biogenesis, structure and function of the key cell organelles discuss their role in pathology and describe organelle-specific disease mechanisms
- describe typical inherited diseases in terms of their occurrence, biochemistry behind their origin, and their analysis and treatment possibilities
- present and defend a scientific presentation on a theme related to inherited diseases.

**Contents:**

The course provides knowledge on structure and function of mitochondria, peroxisomes, endoplasmic reticulum (ER) and the Golgi apparatus, and diseases - also inherited ones - concerned with these cell organelles; as well as gene defects, their inheritance, detection and correction with gene therapy. The course involves student presentations of latest findings on inherited diseases as pair work.

**Mode of delivery:**

Face to face teaching

**Learning activities and teaching methods:**

34 h lectures and seminars including student presentation and student opponents. Seminars are obligatory.

**Target group:**

MSc / Molecular medicine

**Prerequisites and co-requisites:**

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

**Recommended optional programme components:**

-

**Recommended or required reading:**

Lecture notes, student seminar presentations, research articles. Recommended accompanying texts: Thompson & Thompson, Genetics in Medicine; Strachan, T., Read, A.P.: Human Molecular Genetics, Bios. Scientific Publishers Limited; Aula et al., Perinnöllisyyslääketiede

**Assessment methods and criteria:**

Seminars and exam. 1/5 of the grade is based on the seminar presentation and opponent work and 4/5 on the exam in which the student must display an understanding on how the basic biochemical knowledge translates from the bench to the bedside.

**Grading:**

1-5/fail

**Person responsible:**

Valerio Izzi

**Working life cooperation:**

no

**Other information:**

Location of instruction: Kontinkangas

**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

**740386A: Physiological biochemistry, 5 op**

**Voimassaolo:** 01.01.2017 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

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

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

**Opettajat:** Kaija Autio

**Opintokohteen kielet:** English, Finnish

**Leikkaavuudet:**

740371A Physiological Biochemistry 4.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English / Finnish

**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:**

20 h lectures, 2 h seminars, 10 h laboratory work and home work. Seminars, home work 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: 751323A Animal physiology 5 op

**Recommended or required reading:**



Murray et al. Harpers' Illustrated Biochemistry (29<sup>th</sup> edition)

**Assessment methods and criteria:**

Home work and final exam

**Grading:**

1-5/fail

**Person responsible:**

Kaija Autio and Tuire Salonurmi

**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:**

36 h lectures including student presentations, 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, 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.

## 744626S: Protein chemistry II, 5 op

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Lari Lehtiö

**Opintokohteen kielet:** English

**Leikkaavuudet:**

744620S Protein chemistry II 3.0 op  
 747606S Structural enzymology 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

M.Sc. yr1 autumn

**Learning outcomes:**

After completion of this course students are able to:

- Discuss professional literature dealing with advanced techniques of protein analysis
- Plan the expression, purification and characterization of a given protein
- Present and analyze work related to protein purification and analysis
- Describe enzyme reaction mechanisms and the meaning of Michaelis-Menten kinetic constants
- Define the relation between reaction rates and free energy barriers
- Describe the basic concepts of the transition state theory
- Tell the importance of active site electrostatics and dynamics

**Contents:**

The course provides a "real-life" problem-based approach to practical protein chemistry, including purification, biophysical analysis, kinetics and protein structures. It comprises a small number of revision lectures and advanced lectures on structural enzymology. The course contains problem solving based exercises with a further level of complexity built in compared with Protein Chemistry I. The course includes a student presentation, home work and a student report in the form of a research plan, but does not include a final examination. Attendance to the seminars is compulsory.

**Mode of delivery:**

Face to face teaching and home exercises

**Learning activities and teaching methods:**

32 hr Lectures and seminars, plus exercises and writing of a research plan

**Target group:**

Major students

**Prerequisites and co-requisites:**

Protein Chemistry I

**Recommended optional programme components:**

-

**Recommended or required reading:**

Alan Fersht, Structure and Mechanism in Protein Science; <http://www.fersht.com/Structure.html>

**Assessment methods and criteria:**

Continuous assessment, presentations, research plan

**Grading:**

1-5/fail

**Person responsible:**

Lari Lehtiö

**Working life cooperation:**

No

**Other information:**

Location of instruction: Kontinkangas

**747618S: Protein production and analysis, 10 op**

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Lloyd Ruddock

**Opintokohteen kielet:** English

**Leikkaavuudet:**

747601S Protein production and analysis 8.0 op

**ECTS Credits:**

10 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, and protein folding. 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:**

56 contact hours of lectures and seminars, 3 assignments, 80 hours of lab

**Target group:**

Int MSc in Prot Sci and exchange students

**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

## 744630S: Systems biology, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Gonghong Wei

Opintokohteen kielet: English

**Leikkaavuudet:**

744619S Systems biology 4.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

M.Sc. 1st-2nd spring

**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

**743668S: Tumor cell biology, 5 op****Voimassaolo:** 01.08.2017 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Faculty of Biochemistry and Molecular Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Thomas Kietzmann**Opintokohteen kielet:** English**Leikkaavuudet:**

743657S Tumor cell biology 3.0 op

**ECTS Credits:**

5 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 modes of carcinogenesis, tumor metabolism, the formation of oncogenes, the action of tumor suppressor genes and the induction of tumors by viruses.

The course covers also aspects of tumor diagnostics and therapy. The course involves lectures 20h with included 10h seminars, and reading literature with which 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:**

20 h lectures and student presentations upon request in seminars

**Target group:**

MSc / Molecular medicine

**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

**740385A: Virology, 5 op**

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

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

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

**Opettajat:** Thomas Kietzmann

**Opintokohteen kielet:** English

**Leikkaavuudet:**

740380A Virology 3.0 op

**ECTS Credits:**

5 credits

**Language of instruction:**

English

**Timing:**

B.Sc. yr3 spring or M.Sc yr1-yr2 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, 10h seminars, and reading literature with which 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

**Grading:**

1-5/fail

**Person responsible:**

Thomas Kietzmann

**Working life cooperation:**

No

**Other information:**

This module is the same as Virology (743667S). Location of instruction: Kontinkangas

## 744632S: Yeast genetics, 5 op

**Voimassaolo:** 01.08.2017 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

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

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

**Opettajat:** Alexander Kastaniotis

**Opintokohteen kielet:** English

**Leikkaavuudet:**

744623S Yeast genetics 6.0 op

**ECTS Credits:**

5 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. 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:**

14 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:**

-

**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