

Opasraportti

LuTK - Biochemistry (2009 - 2010)

Biochemistry is the study of life at the molecular level. Based on underlying chemical principles biochemists study the details of biological systems at both macro- and micro- scales in whole organisms, in cells, in the test tube and by structural and computational based analysis. Even the simplest living systems are extremely complicated, and comprise a vast array of interconnecting processes. These processes are said to be governed by our genes, the genetic code which makes us who and what we are. Genes are not everything though; the information encoded within them is converted into proteins and it is proteins that are the primary workers in the cell, playing fundamental roles in all aspects of biochemistry. Smaller molecules also play a key role, both through the complex cycles of metabolism, generating energy and essential cellular precursors from nutrients taken from the external world and by playing a role in modulating the function of genes and of proteins.

Sometimes cellular processes go wrong, due to genetic mutations or to external environmental factors or to chance events, and then disease states such as cancer, diabetes, cystic fibrosis, Alzheimer's arise. Only by understanding both the details of the underlying mechanisms of cellular action and the complex interplay of 30,000 gene products, a million different proteins and thousands of metabolites can these diseases be understood and effective treatments generated. These treatments may be small molecules, designed both to be targeted to the appropriate site within the body and to inhibit a specific cellular process through rational drug design, or they may be macromolecules, such as proteins produced on an industrial scale by the biotech industry, or there is the growing area of gene therapy, replacing a loss of function by introducing a working gene.

All of this, the understanding of the mechanisms of cellular action at a molecular level along with the rational design and production of therapeutic treatments, is the work of the biochemist.

Education

Education of biochemists was changed to a new degree system in EU since autumn 2005. First degree to take is a 3-year candidate degree (BSc, Bachelor of Science) followed by a 2-year master degree (MSc, Master of Science). Purpose is to harmonize degrees in biochemistry in different universities, shorten graduating times and facilitate transfer of students between universities in different EU countries. The first MSc degree programmes under a new degree system started in autumn of 2008. Since autumn 2007 Department of Biochemistry has organized Master Degree Programme in Protein Science and Biotechnology for international students.

Students who have started their studies before autumn 2005 in the old system are allowed to take their degrees with courses of the old degree system not later than study year 2009/2010. A student makes a personal study plan (HOPS) for BSc degree (180 credits) and for MSc degree (120 credits). Since the study year 2010/2011 all students must take their degrees with courses of the new system.

Mission of the Department of Biochemistry is that current and high level teaching cannot be given without strong basic research. This can be seen in operational principles of the department. Innovative specialists will be needed in the field. Teaching is seen as an entity where both basic and doctoral education including post doctoral training in abroad is noticed.

Post graduate training has an important role in the department. Research work for PhD degree is often started at the end of MSc phase when a student is doing his Pro gradu project. Many research groups of international level are operating in the department and about 40 PhD students are working there at the present moment. Post graduate training is well trained and linked to clear research projects.

Most of the students graduated from Department of biochemistry, University of Oulu are working in universities within

research and teaching, some are employed by industry, business or by different educational institutes for tasks in research, development, communication and management. One third of the graduated students have taken a degree of licenciate and about one fifth have PhD degree. Most of the latter have spent a post-doctoral period in abroad.

Studies

The Amanuensis of the department helps in matters related to studies. In questions concerning a single study module student can contact the responsible person of the course

To all courses and exams organized by department must be subscribed via WebOodi (<https://weboodi.oulu.fi/oodi>) before deadline.

Recommended order for courses for a bachelor degree is presented in the figure (www.biochem.oulu.fi/studies/BSc_eng.pdf). For many biochemistry courses there are some previous courses required as a prerequisite.

As a part of the studies in biochemistry, a student will use literature and/or results from course experiments to make many kinds of written exercises (reports, Pro gradu etc.). A report cannot be a copy of the other text and all citations from other texts or figures must present clearly as references. Copying and using of text of other student are forbidden and will lead to punishment and rejection of the report.

Biochemistry as a minor subject

Biochemistry courses can be attended freely by taking restrictions into account: If the work places in the lab or equipment are not enough for all students participants will be qualified.

To all courses and exams organized by department must be subscribed via WebOodi (<https://weboodi.oulu.fi/oodi>) before deadline.

A record of biochemistry as a minor subject will be given when the amount of accepted studies is at least 15 credits.

Examinations and grades

Time and a place of examinations are informed on a timetable for each term in the home page of department (<http://www.biochem.oulu.fi>). To exams, students must be subscribed via WebOodi (<https://weboodi.oulu.fi/oodi>) before deadline. Scale is 0-5. The lowest accepted grade is 1. Half of the maximum points gives a grade 2. Some courses are graded to pass/fail. Three exams are organized for each course. A course must be passed during the given time, not in other year.

A final grade for Bachelor and Master degree in biochemistry and for biochemistry as a minor subject will be calculated as follows: the Grades of graded courses are multiplied by the number of credits. The final grade is the sum of products divided by the total number of credits.

Final grades will be determined as follows:

- 1/5 Sufficient 1,00 - 1,49
- 2/5 Satisfactory 1,50 - 2,49
- 3/5 Good 2,50 - 3,49
- 4/5 Very Good 3,50 - 4,49

5/5 Excellent 4,50 - 5,00

Marking of the final grade will be given by Tuula Koret (BK228)

Lines and degrees

Department of biochemistry offers one bachelors level degree, **Biochemistry** and two masters level degrees in lines **Protein Science and Biotechnology** and **Molecular and Cellular Biology**.

- 1) Biochemistry. B.Sc. Degree
- 2) Protein Science and Biotechnology. Entirely in english.
- 3) Molecular and Cellular Biology. In finnish and in english.

Also Department of Biochemistry offers Master´s Degree Programme in Protein Science and Biotechnology for international students where curriculum differs slightly from line Protein Science and Biotechnology.

Bachelor of Science (Biochemistry)

Education leading to a Bachelor's degree in biochemistry provides the student with:

- fundamental knowledge in biochemistry and ancillary subjects as well as the ability to follow developments in that field;
- capability to understand scientific thinking and to use scientific methods
- capability to continue to the higher university degree and the capability for life-long learning;
- capability to respond to the high public awareness and impact of the Biosciences
- capability to participate in cooperative and goal-oriented teamwork and in individual working
- capability to apply the acquired knowledge in working life;
- proficiency in Finnish and Swedish as stipulated in the Degree Statute, as well as proficiency in English;
- transferable and cognitive skills, including the ability to communicate effectively.

The credit requirement for the lower university degree of Bachelor of Science (Biochemistry) is 180. Studies are organized such that students can complete the degree within three years of full-time study.

Obligatory course units at the beginning of studies are common to all students, but students also select course units specific to their longer-term goals.

A Bachelor's degree consists of the following elements:

B.Sc. Degree

General studies	10 credits
Basic studies in Biochemistry	28 credits
Intermediate studies in Biochemistry	69 credits
Maturity test	0 credits
Chemistry	29 credits
Biology and statistic	24 credits
Optional studies	20 credits

Total at least 180 credits

Master of Science (Protein Science and Biotechnology; Molecular and cellular biology)

Education leading to a Master's degree in Protein Science and Biotechnology or Molecular and cellular biology provides the student with:

- advanced knowledge in the major subject;
- capacity to apply scientific knowledge and methods to topical tasks and to undertake scientific research;
- capacity to master information and data and their setting within a theoretical network accompanied by critical analysis and assessment to enable understanding of the subject area as a coherent whole;
- good language skills for national and international tasks;
- transferable and cognitive skills, including the ability to communicate effectively and critically about science using a variety of approaches;
- The skills required for the acquisition of further knowledge, including the abilities to conceive, design and implement independent research and
- capability for scientific postgraduate work.

A Master degree consists of the following elements:

M.Sc. Degree

Obligatory advanced courses	67-74 credits
Maturity test	0 credits
Optional studies	46-54 credits
Total at least	120 credits

STUDIES FOR B.Sc. DEGREE

General studies	10 credits	credits	Semester
Orientation (740072Y)		1	Autumn yr 1
English for biochemists I (902100Y)		3	Autumn yr 1-Spring yr 1
English for biochemists II (902101Y)		3	Spring yr 2
Swedish (901004Y)		3	Spring yr 3
Basic studies in biochemistry	28 credits		
Biomolecules for biochemists (740143P)		8	Autumn yr 1-Spring yr 1
Biochemical methodologies I (740144P)		8	Spring yr 1
Metabolism I (740146P)		6	Spring yr 1
Physical biochemistry (740145P)		6	Spring yr 1
Intermediate studies in biochemistry	69 credits		
Molecular biology I (740361A)		8	Autumn yr 2
Mikrobiology (740363A)		6	Autumn yr 2
Protein chemistry I (740364A)		8	Autumn yr 2-Spring yr 2
Biochemical methodologies II (740365A)		8	Spring yr 2
Cellular biology (740362A)		6	Autumn yr 3
Metabolism II (740367A)		6	Autumn yr 3

Radiation and safety (740368A)	5	Autumn yr 3
Essay (B.Sc. thesis) (740376A)	10	Autumn yr 3-Spring yr 3
Cellular communication (740366A)	6	Spring yr 3
Maturity test (740377A)	0	Spring yr 3
Final examination (740372A)	6	Spring yr 3

Chemistry 29 credits

Introduction to chemistry (780113P)	12	Autumn yr 1
Introductory laboratory course in chemistry (780122P)	3	Autumn yr 1
Introduction to organic chemistry (780103P)	6	Autumn yr 1-Spring yr 1
Introduction to analytical chemistry (780111P)	4	Spring yr 1
Laboratory course in organic chemistry I (780332A)	4	Autumn yr 2

Biology and statistic 24 op

Cell biology (750121P)	5	Autumn yr 1
Concepts of genetics (753124P)	4	Spring yr 2
Basic methods in statistic I (806109P)	9	Spring yr 2
Introduction to the use of lab. animals (040910A/S)	6	Spring yr 3

Recommended optional studies

Physiological biochemistry(740371A) *	4	Spring yr 3
Basic immunobiology for biochemists (740378A)	3	Spring yr 3
Animal physiology (751388A) *	8	Spring yr 2- Autumn yr 3
Developmental biology-histology (751367A)	7	Spring yr 3
Tutoring / confidential posts (740074Y)	1,5	Year 1-3
Introduction to information retrieval (030005P)	1	Year 3

* at least one of these is required

STUDIES FOR M.Sc.DEGREE**Protein Science and Biotechnology (120 credits)****Compulsory courses**

	credits	Sei
Protein chemistry II (744620S)	3	Aut
Molecular biology II (744621S)	3	Aut
Orientation to research work (744617S)	12-20	
Pro gradu experimental work in protein science and biotechnology (747691S)	28	
Pro gradu thesis in protein science and biotechnology (747692S)	20	
Maturity test (740672S)	0	

Optional specialist courses (a minimum of 4 of these courses must be taken)

Basic aspects of protein crystallographic methods (747605S)	3	Aut
Structural enzymology (747606S)	3	Spi
Biochemistry of protein folding (747602S)	2,5	Spi
Systems biology (744619S)	4	Spi
Bioinformatics (747603S)	2,5	Spi
Biological NMR spectroscopy (784637S, Dept. of Chemistry)	3	Spi
Introduction to biocomputing (747604S)	3	Aut

Other optional courses

Dissertation (744618S)	18	
Final examination in protein science and biotechnology (747693S)	9	

Yeast genetics (744623S)	6	
Neurobiology (743655S)	4	Spr
Bioreactor technology (488304S, Bioprocess Engineering Laboratory)	6	Aut
Advanced course for biotechnology (488305S, Bioprocess Engineering Laboratory)	5	Spr
Advanced information skills (300002M, Science and Technology library Tellus)	1	
Biochemistry of inherited diseases (743604S)	3	Aut
Biochemistry of connective tissue (741660S)	2,5	Spr
Biochemistry of cell organelles (743656S)	2,5	Aut
Optional courses at any university	0-12	

Molecular and cellular biology (120 credits)

	credits	Semester
Obligatory courses		
Protein chemistry II (744620S)	3	Autumn yr
Molecular biology II (744621S)	3	Autumn yr
Orientation to research work (744617S)	12-20	
Pro gradu experimental work in molecular and cellular biology (743694S)	28	
Pro gradu thesis in molecular and cellular biology (743695S)	20	
Maturity test(740672S)	0	
Optional specialist courses (a minimum of 4 of these courses must be taken)		
Biochemistry of inherited diseases (743604S)	3	Autumn
Biochemistry of connective tissue (741660S)	2,5	Spring
Systems biology (744619S)	4	Spring
Neurobiology (743655S)	4	Spring
Bioinformatics (747603S)	2,5	Spring
Biochemistry of cell organelles (743656S)	2,5	Autumn
Other optional courses		
Dissertation (744618S)	18	
Molecular Development Biology (040120A) (LTK)	2	Spring (ev)
Final examination in molecular and cellular biology (743696S)	9	
Yeast genetics (744623S)	6	Spring
Advanced information skills (300002M, Tiedekirjasto Tellus)	1	
Basic aspects of protein crystallographic methods (747605S)	3	Autumn
Structural enzymology (747606S)	3	Spring
Biochemistry of protein folding (747602S)	2,5	Spring
Introduction to biocomputing (747604S)	3	Spring
Biological NMR spectroscopy (784637S, Dept. of Chemistry)	3	Spring
Optional courses at any university	0-12	

International Master's Degree Programme in Protein Science and Biotechnology (120 credits)

	credits	Semester
Obligatory courses		
Protein production and analysis (747601S)	8	Autumn yr1
Biochemical methodologies II (747608S)	8	Autumn yr1
Orientation to research work (744617S)	12-18	
Pro gradu experimental work in protein science and biotechnology (747691S)	28	
Pro gradu thesis in protein science and biotechnology (747692S)	20	
Maturity test (740672S)	0	
Optional specialist courses (at least 4 must be taken)		
Basic aspects of protein crystallographic methods (747605S)	3	Autumn
Structural enzymology (747606S)	3	Spring
Biological NMR spectroscopy (784637S) (Dept. of Chemistry)	3	Spring
Biochemistry of protein folding (747602S)	2,5	Spring
Systems biology (744619S)	4	Spring
Bioinformatics (747603S)	2,5	Spring
Introduction to biocomputing (747604S)	3	Autumn
Optional courses		
Dissertation (744618S)	18	
Final examination in protein science and biotechnology (747693S)	9	
Bioreactor technology (488304S) (Bioprocess Engineering Laboratory)	6	Autumn
Advanced course for biotechnology (488305S) (Bioprocess Engineering Laboratory)	5	Spring
English for biochemists III (902122Y)	3	Spring
Information Skills / Sources of Scientific Information (030005P Science and Technology library Tellus)	1	
Neurobiology (743655S)	4	Spring
Yeast genetics (744623S)	6	Spring
Optional courses at any university	0-12	

Optional courses at any universities

Up to 12 credits of courses can be taken from other suitable courses taught at any uni-versity. Courses must be connected to biochemistry or logically support some aspect of it and they will have to be at an appropriate level. The content of the courses must not be too similar to other courses which have counted towards the students BSc degree or towards their MSc. In all cases the departmental amanuensis should be contacted to confirm acceptance / suitability. We would advise that this is done before the course is taken, especially in the case of courses taken from universities outside Finland. A list of previously accepted courses can be found on the teaching pages of the departmental web pages, please consult this list before contacting the amanuensis.

Department Staff

Address: University of Oulu, Department of Biochemistry, P.O.BOX 3000, FIN-90014 UNIVERSITY OF OULU

fax: +358-8-553 1141, tel +358-8-553 1200, http://www.biochem.oulu.fi/index_e.html

Updated list of staff http://www.biochem.oulu.fi/staff/index_e.html

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

488305S: Advanced Course for Biotechnology, 5 op
 300002M: Advanced Information Skills, 1 op
 751388A: Animal physiology, 4 op
 806109P: Basic Methods in Statistics I, 9 op
 747605S: Basic aspects of protein crystallographic methods, 3 op
 740378A: Basic immunobiology for biochemists, 3 op
 740144P: Biochemical Methodologies I, 8 op
 740365A: Biochemical Methodologies II, 8 op
 747608S: Biochemical methodologies II, 8 op
 743656S: Biochemistry of cell organelles, 2,5 op
 741660S: Biochemistry of connective tissue, 2,5 op
 743604S: Biochemistry of inherited diseases, 3 op
 747602S: Biochemistry of protein folding, 2,5 op
 747603S: Bioinformatics, 2,5 op
 784637S: Biological NMR Spectroscopy, 3 op
 740148P: Biomolecules, 5 op
 740143P: Biomolecules for Biochemists, 8 op
 740147P: Biomolecules for Bioscientists, 8 op
 488304S: Bioreactor Technology, 6 op
 750121P: Cell biology, 5 op
 740362A: Cellular Biology, 6 op
 740366A: Cellular Communication, 6 op
 753124P: Concepts of genetics, 4 - 7 op
 751367A: Developmental biology-histology, 4 op
 744618S: Dissertation, 18 op
 902100Y: English for Biochemists 1, 3 op
 902122Y: English for Biochemists 3, 3 op
 740376A: Essay (B.Sc. thesis), 10 op
 740372A: Final Examination, 6 op
 743696S: Final examination in molecular and cellular biology, 9 op
 747693S: Final examination in protein science and biotechnology, 9 op
 030005P: Information Skills, 1 op
 780111P: Introduction to Analytical Chemistry, 4 op
 780113P: Introduction to Chemistry, 12 op
 780103P: Introduction to Organic Chemistry, 6 op
 747604S: Introduction to biocomputing, 3 op
 780122P: Introductory Laboratory Course in Chemistry, 3 op
 040910S: Laboratory Animal Course For Scientists, 6 op
 780332A: Laboratory Course I in Organic Chemistry, 4 op
 740377A: Maturity test (B.Sc. degree), 0 op
 740672S: Maturity test (M.Sc. degree), 0 op
 740149P: Metabolism I, 4 op
 740146P: Metabolism I, 6 op
 740367A: Metabolism II, 6 op
 740375A: Metabolism II, 4 op
 740363A: Microbiology, 6 op
 740374A: Microbiology, 3 op
 740361A: Molecular Biology I, 8 op
 740373A: Molecular Biology I, 4 op
 040120A: Molecular Development Biology, 2 op

744621S: Molecular biology II, 3 op
 743655S: Neurobiology, 4 op
 740072Y: Orientation, 1 op
 744617S: Orientation to research work, 0 - 20 op
 740145P: Physical Biochemistry, 6 op
 740371A: Physiological Biochemistry, 4 op
 743694S: Pro gradu experimental work in molecular and cellular biology, 28 op
 747691S: Pro gradu experimental work in protein science and biotechnology, 28 op
 743695S: Pro gradu thesis in molecular and cellular biology, 20 op
 747692S: Pro gradu thesis in protein science and biotechnology, 20 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
 740368A: Radiation and Safety, 5 op
 747606S: Structural enzymology, 3 op
 901004Y: Swedish, 2 - 3 op
 744619S: Systems biology, 4 op
 740074Y: Tutoring/confidential posts, 1,5 op
 744623S: Yeast genetics, 6 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

488305S: Advanced Course for Biotechnology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Sanna Taskila

Opintokohteen kielet: English

Leikkaavuudet:

480450S Bioprocesses III 5.0 op

Learning outcomes:

This course aims to give the student a more profound and advanced perspective to major biotechnological applications with recombinant microbes.

Objectives: After completing this course, the student will be able to describe the most important recombinant protein production processes used in biotechnology, e.g. production of proteins in bacteria and yeast, and in animal and plant cells. Further, the student will be able to compare the different production processes and to choose techniques for different purposes.

Contents:

Stress responses in microorganisms. Recombinant protein production in bacteria. Fermentation and scale-up. Cell disruption and centrifugation. Protein folding. Protein purification. Recombinant protein production in yeasts and fungi, by animal cell culture technology, in transgenic animals, in plants and plant cultures. Metabolic engineering of pathways. Enzyme applications.

Learning activities and teaching methods:

Lectures, lesson exams and/or final examinations; or Seminars and report.

Recommended optional programme components:

The preceding courses by the Bioprocess Engineering Laboratory (especially Basics of biotechnology and Bioreactor Technology) or respective knowledge.

Recommended or required reading:

Will be announced at the lectures / seminars.

300002M: Advanced Information Skills, 1 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Other Studies

Laji: Course

Vastuuyksikkö: Faculty of Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Sassali, Jani Henrik

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

751388A: Animal physiology, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen oppimateriaali:

Campbell, Neil A. , , 2005

Opintokohteen kielet: Finnish

Leikkaavuudet:

755323A Animal physiology 5.0 op

ECTS Credits:

4-8 cr.

Language of instruction:

Finnish.

Timing:

B.Sc. 2nd spring (lect), 3rd autumn (prac).

Learning outcomes:

After completing the course the student is able to form a general view of animal body functions, the regulation of organ systems, and the background of human health and diseases. In addition, the students learn basic methods in animal physiology research.

Contents:

The practical laboratory experiments focus on the basic problematic of physiological themes including nervous system, muscles, circulation, nutrition, metabolism, immune system, hormones and reproduction using the principal physiological methods and computer aided measurements.

Learning activities and teaching methods:

50 h lectures and independent studying, mid-semester exams, home essays (spring) 32 h laboratory, final exam (autumn).

Target group:

Compulsory to BS, TEAbs and ECO1, lectures 4 cr. compulsory to TEAeco and optional to ECO2.

Recommended optional programme components:

750121P or equivalent knowledge. This course is a prerequisite for courses 751x84A/S, 751636S and 751635S.

Recommended or required reading:

Chapter Animal Form and Function in Campbell, N. A. & Reece J. B. 2008: Biology, 8th ed., Benjamin Cummings, New York Inc., 1312 p., handouts and practical work handout of animal physiology.

Assessment methods and criteria:

Home essays and final exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Seppo Saarela.

806109P: Basic Methods in Statistics I, 9 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Päckilä

Opintokohteen oppimateriaali:

Grönroos, Matti (2) , , 2003

Heikkilä, Tarja , , 1998

Helenius, Hans , , 1989

Ranta, Esa (2) , , 1991

Wild, Christopher J. , , 2000

Opintokohteen kielet: Finnish

Leikkaavuudet:

- 806119P A Second Course in Statistics 5.0 op
- 806116P Statistics for Economic Sciences 5.0 op
- 806117P Analysis of continuous response variable 5.0 op
- ay806109P Basic Methods in Statistics I (OPEN UNI) 9.0 op

ECTS Credits:

9 cr

Learning outcomes:

On successful completion of this course, the student will be able to

- use basic methods of collecting and describing data
- apply methods of statistical inference in some simple situations
- interpret listing of some statistical software

Contents:

Principles of collecting data and describing data with suitable tables, graphs and numerical measures are treated. The basic idea of estimation and statistical tests will be presented as well as some of the most common used confidence intervals and statistical tests. One aim is also to give basic knowledge from some statistical software.

Person responsible:

Marjatta Mankinen (economics) and Jari Päckilä (others)

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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 spring

Learning outcomes:

Students should understand

- * Key aspects of the protein crystallization methods
- * The importance of crystals for obtaining the structure of a protein
- * The importance of the Fourier transform method in the structure determination method
- * The phase problem
- * 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.

Learning activities and teaching methods:

20 h lectures and seminars

Recommended or required reading:

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

Grading:

pass/fail

Person responsible:

Rik Wierenga

740378A: Basic immunobiology for biochemists, 3 op

Voimassaolo: 01.08.2009 - 31.07.2010

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr3 spring

Learning outcomes:

Students understand the basic concepts and mechanisms of immunobiology, which deepens their knowledge acquired on molecular and cellular biology, biochemistry and protein chemistry courses.

Contents:

The course provides the student with good basic knowledge of the composition of the immune system at molecular and cellular levels. Subjects for study include the overview of the immune system, natural-, acquired- and autoimmunity, immune response for bacteria and viruses as well as the regulation and perturbations of the immune system.

Learning activities and teaching methods:

Lectures of the module are selected parts of basic microbiology course of the Medical Faculty (responsible person Prof. Olli Vainio). The subjects and the amount of lectures will be specified yearly after the completion of the curriculum of the above mentioned course. The module includes lectures (ca. 10-12 h), problem/literature based work and an exam.

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

740144P: Biochemical Methodologies I, 8 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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 spring

Learning outcomes:

Upon completion the student should be able to:

- Know and use basic methods used in biochemical research laboratory
- Use laboratory equipment and work safely
- Prepare solutions used in the lab
- Keep a lab note book and 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, 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, titration and pH measurement.

Learning activities and teaching methods:

160 h lab including pre lab lectures and practicals

Grading:

1-5/fail

Person responsible:

Jari Heikkinen

740365A: Biochemical Methodologies II, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Ulrich Bergmann

Opintokohteen kielet: English

Leikkaavuudet:

747608S	Biochemical methodologies II	8.0 op
---------	------------------------------	--------

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

B.Sc. yr2 spring

Learning outcomes:

At the end of the course, participants should

- * understand the theoretical basis of the main biochemical analysis methods
- * be familiar with the different instruments and their use.
- * know the potential of the different analytical techniques be able to develop strategies for specific questions in protein and proteome-analysis.

Contents:

During this module students will analyze their own protein samples that have been produced in the previous "protein chemistry I / protein production and analysis course". The course will cover principles and practical applications of some of the more advanced methodologies used in practical biochemistry, including fluorescence spectroscopy, stopped and quenched flow analysis of enzymatic reactions, circular dichroism, surface plasmon resonance, micro-calorimetry, micro-array technology, 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.

Learning activities and teaching methods:

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

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

747608S: Biochemical methodologies II, 8 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Ulrich Bergmann

Opintokohteen kielet: English

Leikkaavuudet:

740365A Biochemical Methodologies II 8.0 op

Language of instruction:

English

Timing:

Int MSc 1st autumn

Learning outcomes:

At the end of the course, participants should

- understand the theoretical basis of the main biochemical analysis methods
- be familiar with the different instruments and their use.
- know the potential of the different analytical techniques be able to develop strategies for specific questions in protein and proteome-analysis.

Contents:

During this module students will analyze their own protein samples that have been produced in the previous "protein chemistry I / protein production and analysis course". The course will cover principles and practical applications of some of the more advanced methodologies used in practical biochemistry, including fluorescence spectroscopy, stopped and quenched flow analysis of enzymatic reactions, circular dichroism, surface plasmon resonance, micro-calorimetry, micro-array technology, 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

Learning activities and teaching methods:

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

Target group:

Int M.Sc.

Recommended optional programme components:

Previous studies: Protein production and analysis (747601S)

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

743656S: Biochemistry of cell organelles, 2,5 op

Voimassaolo: - 31.07.2010

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Kalervo Hiltunen

Opintokohteen kielet: English

Leikkaavuudet:

743659S Biochemistry of cell organelles 3.0 op

ECTS Credits:

2.5 credits

Language of instruction:

Finnish/english

Timing:

M.Sc. yr1-yr2 autumn

Learning outcomes:

Upon completion student should understand:

- o Why is metabolism compartmentalized in eukaryotic cells?
- o Role of cell organelles in metabolism
- o Targeted transport of biomolecules across membranes of cell organelles

Contents:

Metabolism in eukaryotic cell is compartmentalized to cell organelles. The course will cover biogenesis and biochemistry of following organelles: mitochondria, endoplasmic reticulum, lysosomes, peroxisomes and nucleus. Also transport of proteins to these cell organs is discussed.

Recommended optional programme components:

Cellular biology or equivalent course

Grading:

pass/fail

Person responsible:

Kalervo Hiltunen

741660S: Biochemistry of connective tissue, 2,5 op

Voimassaolo: - 31.07.2010

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Raili Myllylä

Opintokohteen kielet: Finnish

ECTS Credits:

2.5 credits

Language of instruction:

Finnish

Timing:

M.Sc. yr1-yr2 spring

Learning outcomes:

Upon completion the student should understand

- How connective tissue is formed and why organs need connective tissue

- Characters of the diseases of connective tissue
- How to make an understandable presentation from a scientific publication
- What are the methods used in the publication to get the published results

Contents:

The purpose of this course is to introduce the structure, function and biosynthesis of the components of connective tissue, as well as the errors in connective tissue formation which cause various diseases.

Learning activities and teaching methods:

14 h lectures and student tasks

Recommended or required reading:

Alberts *et al.*, Molecular Biology of the Cell, 2002 (partly); Lodish *et al.*, Molecular Cell Biology, (partly); Seibel, M. J., Robins, S.P., Bilezikian, J.P. Dynamics of Bone and Cartilage Metabolism, Academic Press, newest editions ; Reviews of connective tissue and its diseases, scientific articles

Person responsible:

Raili Myllylä

743604S: Biochemistry of inherited diseases, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

M.Sc yr1-yr2 autumn

Learning outcomes:

Upon completion the student should understand

- The most common inherited diseases and how they can be analyzed and treated
- Biochemistry behind the inherited diseases
- How to make an understandable presentation from the field of inherited diseases
- How to answer questions raised by the presentation

Contents:

This course provides information on mutations behind inherited diseases: how mutations are inherited, how they will be found and how they can be cured by gene therapy. Scientific articles will also be studied by small groups.

Grading:

1-5/fail

Person responsible:

Heli Ruotsalainen

747602S: Biochemistry of protein folding, 2,5 op

Voimassaolo: - 31.05.2011

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Leikkaavuudet:

747611S Biochemistry of protein folding 3.0 op

ECTS Credits:

2,5 credits

Language of instruction:

English

Timing:

M.Sc., yr1-yr2 spring

Learning outcomes:

Upon successful completion students should:

- * Be able to present and discuss issues presented in primary literature on a variety of aspects of protein folding.
- * Display an understanding of the theoretical and practical implications of in vivo and in vitro 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. The module is assessed based on a report prepared on individual topics and on participation in the seminars.

Learning activities and teaching methods:

16 contact hours of lectures and seminars

Target group:

M.Sc. in Protein science and biotechnology

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

747603S: Bioinformatics, 2,5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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 completion the course student should be able to:

- * Use web-based bioinformatics tools.
- * Process the information and find solutions into various problems
- * Analyse and present the findings in the form of 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.

Learning activities and teaching methods:

14 contact hours of lectures and practicals

Grading:

1-5/fail

Person responsible:

Ari-Pekka Kvist

784637S: Biological NMR Spectroscopy, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Mattila, Sampo Antero

Opintokohteen oppimateriaali:

Cavanagh, John, , 1996

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

Finnish and English on demand.

Timing:

The course is lectured every other year.

Learning outcomes:

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

Contents:

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

Learning activities and teaching methods:

14 hours of lectures + applications, 30 hours of exercises, one final examination.

Target group:

Chemistry, optional.

Recommended or required reading:

Cavanagh: Protein NMR Spectroscopy, Academic Press, 1995, ISBN: 0121644901.

Person responsible:

Senior assistant S. Mattila

740148P: Biomolecules, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

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 should:

- Have a basic understanding of the composition, structure and function of the major groups of biomolecules in cells; nucleic acids, proteins, carbohydrates and lipids and the forces that modulate their function.
- Have an appreciation of the requirement to contextualize and critically evaluate information.

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.

Learning activities and teaching methods:

30 h lectures, plus exercises

Target group:

Minor subject students

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Other information:

This module is the same as Biomolecules for Biochemists except that it contains no practical component.

740143P: Biomolecules for Biochemists, 8 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

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 should:

- Have a basic understanding of the composition, structure and function of the major groups of biomolecules in cells; nucleic acids, proteins, carbohydrates and lipids and the forces that modulate their function.
- Have an appreciation of the requirement to contextualize and critically evaluate information.
- In addition, students on the 8op versions should have acquired competence in basic biochemical laboratory skills, calculations, problem solving and the ability 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.

Learning activities and teaching methods:

30 h lectures, 48 h lab., plus exercises

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

740147P: Biomolecules for Bioscientists, 8 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

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

Timing:

autumn-spring

Learning outcomes:

Upon successful completion students should:

- Have a basic understanding of the composition, structure and function of the major groups of biomolecules in cells; nucleic acids, proteins, carbohydrates and lipids and the forces that modulate their function.
- Have an appreciation of the requirement to contextualize and critically evaluate information.
- In addition, students on the 8op versions should have acquired competence in basic biochemical laboratory skills, calculations, problem solving and the ability 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.

Learning activities and teaching methods:

30 h lectures, 48 h lab., plus exercises

Target group:

minor subject students

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Other information:

This module is the same as Biomolecules for Biochemists except that there is the option for some of the exercises to be in Finnish.

488304S: Bioreactor Technology, 6 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Johanna Panula-Perälä, Heikki Ojamo

Opintokohteen kielet: English

Leikkaavuudet:

488321S Bioreactor technology 5.0 op

480431S Bioprocesses II 5.0 op

Learning outcomes:

The course provides the student the basics of bioreactor technology. It specifically concentrates on bioreactor performance and operation and on microbial growth kinetics.

Learning outcomes : After completing this course, the student will be able to verbally describe the most common equipment, materials and methods related to biotechnological processes, microbial growth and cultivation and sterilisation. The student will be able to apply different formulas used in bioreactor technology and based on those, calculate, e.g. parameters connected to microbial growth kinetics. The student will also be able to produce, analyse and interpret microbial growth curves and other bioprocess graphs.

Contents:

The biotechnological process: General process schemes and culture media, reactor design and instrumentation; Sterilisation: Principles, sterilisation of air, sterilisation of medium, kinetics of sterilisation; Microbial growth and cultivation principles: The bacterial growth curve and methods of growth characterisation, growth parameters, the MONOD model, reaction rates and their determination, the lag phase of growth, cellular maintenance, cell death; Kinetics of product and by-product formation, kinetics of oxygen transfer. The batch process, fed-batch process, and continuous processes.

Learning activities and teaching methods:

Lectures, practical simulation exercises, possibly homework. Lecture exams and/or final examinations.

Recommended optional programme components:

The bachelor-level courses from the Bioprocess Engineering Laboratory or respective knowledge.

Recommended or required reading:

For the lectures: Enfors, S.O. & Häggström, L. 2000. Bioprocess Technology. Fundamentals and Applications. Stockholm, Sweden. For the simulation practicals: Computer programme: Fermentation. A Practical approach series. PSI Computer programme, Boza Automatisering BV, Nuenen, NL. Additional literature : Biotechnology (Vol 1-12): a Multi-Volume Comprehensive Treatise. Eds H.-J. Rehm and G. Reed, Weinheim, Wiley-VCH, 1991-; Aittomäki, E., Eerikäinen, T., Leisola, M., Ojamo, H., Suominen, I. & von Weymarn, N. BioProsessiteknikka. WSOY. Helsinki, 2002.

750121P: Cell biology, 5 op

Voimassaolo: - 31.07.2020

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen oppimateriaali:

Heino, Jyrki (2) , , 2004

Alberts, B. ym., , 2008

Lodish et al., , 2003

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr.

Language of instruction:

Finnish.

Timing:

B.Sc. 1st autumn.

Learning outcomes:

The student is familiar with cellular structure and functioning in plant and animal cells, understands the social structures in multicellular species and knows why and how the genetic organizations (in nucleus, chloroplast and mitochondria) are co-operating, maintaining and regulating the cellular metabolism. Student understands the common origin and evolution of life on planet Earth, and understands the material basis and mechanisms of this continuity.

Contents:

During the recent years especially the development of molecular and microscopic and imaging techniques has increased our knowledge on cells and their social interactions. The structural and functional characteristics of plant and animal cells will be covered as well as the genetic organization maintaining and regulating the system.

Learning activities and teaching methods:

72 h lectures, three final exams (zoology, botany, genetics). Home essays and internet material.

Target group:

Compulsory to the biology and biochemistry students.

Recommended optional programme components:

Cell biology is prerequisite for the following courses: 751367A, 751388A, 752345A, 753124P. Course gives readiness for studies in molecular biology and biochemistry.

Recommended or required reading:

Alberts, B. etc. 2008: Molecular Biology of the Cell (5th ed.). Garland Science Publishing, London, 1268 s. ISBN: 0815341067. (Lodish et al. 2004: Molecular Cell Biology (5th ed.). Freeman, New York, 973 s.). Heino J. & Vuento M. 2004: Solubiologia (2. painos), WSOY, Porvoo 306 s. <http://cc.oulu.fi/~ssaarela/>; <http://www.oulu.fi/genet/cellbiology/>

Assessment methods and criteria:

Three final exams.

Grading:

1-5 / Fail. Final grade is average value of the three final exams.

Person responsible:

Prof. Seppo Saarela, Prof. Hely Häggman and Prof. Jaakko Lumme.

740362A: Cellular Biology, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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. yr3 autumn

Learning outcomes:

- Understand the general molecular mechanisms how the cells function
- Understand how such molecular mechanisms can be studied in vitro and in vivo
- Be able to tract 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.

Learning activities and teaching methods:

24 h lectures, 40 h lab

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Sakari Kellokumpu

740366A: Cellular Communication, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

B.Sc. yr3 spring

Learning outcomes:

Upon completion of the course the students should be able to:

- Discuss the major intra- and intercellular signalling pathways
- Present and discuss characteristic features of signalling pathways
- Have knowledge about methods to study and to 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.

Learning activities and teaching methods:

24 h lectures and student presentations, 40 h practicals

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

753124P: Concepts of genetics, 4 - 7 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumme, Jaakko Ilmari

Opintokohteen oppimateriaali:

Alberts, B. ym., , 2008

Opintokohteen kielet: Finnish

Leikkaavuudet:

757109P Concepts of genetics 5.0 op

ECTS Credits:

4-7 cr.

Language of instruction:

Finnish.

Timing:B.Sc. 1st spring. Biology students: compulsory, Biochemistry students: parts 1 and 3 4 cr. compulsory, biophysics students.**Learning outcomes:**

To understand and remember the genetic basis of life and evolution, on Mendelian and molecular level .

Contents:

Part 1. Mendelian genetics, including the ideas of quantitative and population genetics. Part 2. Molecular genetics: replication, transcription, translation, genetic code, mutations, repair of DNA. Part 3. Selected topics on developmental genetics, genetics of health and threats: viruses and diseases.

Learning activities and teaching methods:

Lectures, homework, the book.

Target group:

Biology students: compulsory (7 cr). Biochemistry students: compulsory parts 1 and 3 (4cr).

Recommended optional programme components:

Course 750121P or equivalent knowledge. This course is prerequisite to all other genetics courses.

Recommended or required reading:Alberts et al. (2008, fifth edition) Molecular Biology of the Cell. Web page (in Finnish) <http://www.oulu.fi/genet/perusteet/>**Assessment methods and criteria:**

Homeworks, participation, exams.

Grading:

1-5 / Fail.

Person responsible:

Prof. Jaakko Lumme.

751367A: Developmental biology-histology, 4 op**Voimassaolo:** - 31.07.2015**Opiskelumoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Department of Biology**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Hohtola, Esa Juhani**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

755320A Developmental biology-histology 5.0 op

ECTS Credits:

5-9 cr. (lectures + exams = 5 cr, lectures + exercises + exam = 9 cr.)

Language of instruction:

Finnish.

Timing:B.Sc. 2nd spring.**Learning outcomes:**

After completing the developmental biology -part of the course the student is able to name the most important events of embryonic development and the structural changes related to them. The student is also able to describe the principles gene regulation related to embryonic development. After completing the histology-part of the course the student is able to describe the various tissue types and the microscopic structure of important organs and is also able to identify tissue types and organs from microscopic sections.

Contents:Motto: *"It is not birth, marriage, or death, but gastrulation, which is truly the most important time in your life."* Lewis Wolpert (1986).

Developmental biology will cover gametogenesis, fertilization, forming of embryonic tissue layers (gastrulation), embryonic induction, signal molecules and the differentiation of the most important tissues and organs

(organogenesis). Histology will first cover various tissue types, their cell types and matrix composition. Thereafter, the microscopic structure and tissue composition of various organs and organ systems will be covered. In both parts, drawing from microscopic slides will support lectures.

Learning activities and teaching methods:

38 h lectures and 44 h exercises, microscopic studying and drawing from the preparates.

Target group:

Compulsory to TEAbs and BS 9 cr, optional for TEAeco.

Recommended optional programme components:

750121P or equivalent knowledge.

Recommended or required reading:

Lecture notes, lecture handouts, laboratory handouts.

Assessment methods and criteria:

Exams (2 exams of lectures, 1 exam of laboratory exercises).

Grading:

1-5 / Fail. Weighting: lecture exams 2/3, laboratory exams 1/3.

Person responsible:

Prof. Esa Hohtola (lectures), Prof. Seppo Saarela (laboratory exercises).

744618S: Dissertation, 18 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Leikkaavuudet:

744631S Dissertation 15.0 op

ECTS Credits:

18 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2

Learning outcomes:

Upon successful completion students should have:

- Developed skills in retrieving, appraising critically, contextualising and integrating information from a wide range of sources
- Developed skills in communicating science in extensive written format and in making and defending scientific arguments
- Developed their abilities to work independently including self motivation, planning, organizational skills and time management.

Contents:

This module is based around the student producing an extensive, in-depth literature report in the style of a scientific review. Students are responsible for finding a suitable supervisor for their dissertation with whom they will discuss the scientific background and relevant literature. Students are strongly encouraged to meet with their supervisor weekly to discuss progress and ideas and to resolve problems. A one-page outline of the dissertation subject area, including details of the supervisor (who need not be from the University of Oulu), must be approved by the module convener before starting this module. While the dissertation subject can be closely linked with the Pro Gradu project subject, students are advised that having distinct topics from these two modules will look better on their CV

Learning activities and teaching methods:

480 hours of student work

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

902100Y: English for Biochemists 1, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902100Y English for Biochemists 1 (OPEN UNI) 3.0 op

Proficiency level:

[CEFR B2 - C1](#) for Reading, Speaking and Listening

Status:

Compulsory for all 1st year biochemistry students unless you have received the grade "L" or "E" in the Finnish matriculation exam, in which case you must attend **EfB 1b** only.

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise.

ECTS Credits:

The student workload is 80 hrs work/ 3 ECTS credits (40 + 40 for parts EfB 1a and EfB 1b).

Language of instruction:

English

Timing:

English for Biochemists 1a (=EfB 1a): 1st year autumn term and

English for Biochemists 1b (=EfB 1b): 1st year autumn (2 lessons) and spring term(11 lessons)

Learning outcomes:

The aim of this course is to develop both the students' reading strategies and their oral/aural fluency.

Learning outcomes:

By the end of the **EfB 1a** you are expected to:

- be familiar with various reading strategies for different purposes
- demonstrate effective note-taking techniques and the ability to summarise when working with texts
- apply personalised vocabulary-learning techniques

By the end of the **EfB 1b** you are expected to:

- have demonstrated lecture listening and note-taking skills in field related situations.
- be able to present field-related subjects and use appropriate field-related vocabulary
- be able to defend a position in a debate
- have demonstrated the ability to participate in pair work communication and small group discussions.

Contents:

Core skills practiced on this course are the following: **EfB 1a:** reading in order to understand biochemistry texts or textbooks and research articles; applying different reading strategies to extract global or detailed information according to the reading purpose; understanding word formation in order to expand vocabulary, both general scientific and field specific; understanding basic grammatical structures of scientific English as well as text structure and cohesion markers for improved comprehension.

EfB 1b : oral/aural skills connected to the students' academic field as well as in everyday conversational situations are practiced to develop communicative fluency. There is a focus on pronunciation, listening and speaking skills.

Target group:

1st year Biochemistry students

Recommended optional programme components:

English for Biochemists 1a (or 902002Y Reading for Academic Purposes) must be completed before taking English for Biochemists 1b.

Recommended or required reading:

Course materials will be provided by the teacher and a copy fee will be collected for the handouts.

Assessment methods and criteria:

Evaluation is based on assessment of active participation in class, the completion of homework tasks and in EfB 1a an end of term examination. For EfB 1b, an oral exam is organised if necessary.

Grading:

Pass/fail

Person responsible:

Eva Braidwood and Karen Niskanen

Other information:*Registration* will take place through the Department of Biochemistry.**902122Y: English for Biochemists 3, 3 op**

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Language and Communication Studies**Laji:** Course**Vastuuyksikkö:** Language Centre**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** English**Leikkaavuudet:**

ay902122Y English for Biochemists 3 (OPEN UNI) 3.0 op

Proficiency level:[C1](#) on the CEFR scale**Status:**

Optional but highly recommended for Int MSc Students

ECTS Credits:

3 ECTS credits

Language of instruction:

English

Timing:

spring term

Learning outcomes:

The course aims to help students acquire understanding of the conventions and expectations of the academic community of biochemists for scientific reporting, and develop presentation and writing skills for their future professional life.

Learning outcomes: By the end of the module, students are expected to be able to

- § write a research article that follows the main discourse conventions of biochemistry
- § acknowledge other authors' ideas in the appropriate way and synthesise these into their own text
- § in an appropriate manner, provide a colleague with constructive suggestions for revising his or her text
- § report their work orally or in writing in an appropriate academic style
- § use principles of good presentation structuring for optimal clarity
- § use principles of good slideshow design to complement preparation, subject knowledge and English language skills

Contents:

This course will cover presentation skills (1 ECTS credit) and writing for scientific purposes (2 ECTS credits).

Learning activities and teaching methods:

The course will comprise 26 classroom hours plus tutorials and independent work on presentation skills and scientific writing. Attendance at all classroom sessions is compulsory.

Target group:

students taking the International Master's programme in Protein Science and Biotechnology

Recommended or required reading:

Course materials will be provided by the teachers and a copy fee will be collected.

Assessment methods and criteria:

Assessment is based on regular completion and quality of course tasks, with particular emphasis on the final product of each part of the course: the final presentation and the final draft of a research article.

Grading:

pass/fail

Person responsible:

Heather Kannasmaa (presentation skills) and Eva Braidwood (scientific writing)

740376A: Essay (B.Sc. thesis), 10 op**Opiskelumuoto:** Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: Finnish

ECTS Credits:

10 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr3 autumn

Learning outcomes:

Students should be able to execute a project to produce a thesis type of output, be well aware of current research trends in biochemistry, be able to critically select knowledge from the literature, be able to discuss and debate scientific results, and be able to choose and evaluate proper form of presentation for each purpose.

Contents:

The theme of the module is public understanding of science and the reporting of biochemical research using different methods and for different audiences. During the course students will learn on a general level about different fields of biochemistry and their specific questions, orientation of biochemical research and organization of research into projects. Practical exercises will contain presenting of a given subject in different forms, which may be a talk, a short article, a poster, a press release or a research proposal. In addition the course is linked to the module Ruotsin kieli (Swedish language).

Learning activities and teaching methods:

about 50 h lectures, seminars, small groups and practicals, also self study and student presentations

Grading:

pass/fail

Person responsible:

Tuomo Glumoff

740372A: Final Examination, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

ECTS Credits:

6 credits

Timing:

B.Sc. yr3 spring

Learning outcomes:

Upon successful completion students should be able to:

- Demonstrate understanding of the full breadth of the core topics of biochemistry
- Integrate material from multiple sources

Contents:

This examination will test the ability of students to integrate knowledge from the core biochemistry modules they have taken during their BSc. It will include questions covering the material from Biomolecules for Biochemists, Biokemian menetelmät I, Physical biochemistry, Aineenvaihdunta I, Molekyylibiologia I, Solujen biologia, Mikrobiologia, Protein Chemistry I, Biochemical methodologies II, Solujen kommunikaatio and Aineenvaihdunta II. The questions will require an understanding of the basic principles of biochemistry and each will be based on subject specific material from at least two modules.

Learning activities and teaching methods:

Student self-study

Grading:

1-5/fail

Person responsible:

Conveners from the core modules coordinated by Lloyd Ruddock

743696S: Final examination in molecular and cellular biology, 9 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

Grading:

1-5/fail

Person responsible:

professor

747693S: Final examination in protein science and biotechnology, 9 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

ECTS Credits:

9 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2

Learning outcomes:

Upon successful completion students should be able to:

- Demonstrate deep understanding of the full breadth of the core topics of biochemistry, protein science and biotechnology
- Integrate material from multiple sources

Contents:

This examination will test the ability of students to integrate knowledge from BSc and MSc level protein science and biotechnology. The questions will require an understanding of the principles of biochemistry and protein science and will be based on subject specific material from relevant BSc and MSc level modules. The format will be an oral examination.

Learning activities and teaching methods:

Student self-study

Assessment methods and criteria:

Oral examination

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Sassali, Jani Henrik, Koivuniemi, Mirja-Liisa

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P Introduction to Information Retrieval 0.0 op

Language of instruction:

English

Learning outcomes:

Students know the different phases of information retrieval process and basic techniques of scientific information retrieval. They will find the most important reference databases of their discipline and know how to evaluate information sources and retrieval results.

Contents:

Retrieval of scientific information, the retrieval process, key databases of the discipline, and evaluation of information retrieval and information sources.

Learning activities and teaching methods:

The course involves training sessions (8h), web-based learning materials, exercises in the Optima learning environment and a final assignment on a topic of the student's own choice.

Recommended or required reading:

Web-based learning material (<http://www.kirjasto.oulu.fi/index.php?id=822>)

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi , <http://www.kirjasto.oulu.fi/index.php?id=738>

780111P: Introduction to Analytical Chemistry, 4 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Paavo Perämäki

Opintokohteen oppimateriaali:

Saarinen, Heikki (1) , , 2004

Kellner, R., Mermet, J.-M., Otto, M., , 2004

Opintokohteen kielet: Finnish

Leikkaavuudet:

780110P Analytical Chemistry I 5.5 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

1st Spring.

Learning outcomes:

After this course student is familiar with basic concepts of quantitative chemical analysis employing classical methods of analysis.

Contents:

Steps in quantitative analysis, statistical evaluation of analytical data, chemical equilibrium in aqueous solutions, gravimetry, titrimetry, spectrophotometry.

Learning activities and teaching methods:

30 hours of lectures plus 10 hours of exercises, two intermediate examinations or one final examination.

Target group:

Biochemistry, Chemistry, compulsory.

Mathematical Sciences, Physical Sciences, optional.

Recommended optional programme components:

Introduction to Chemistry (780113P) or 780101P Introduction to Physical Chemistry and 780102P Introduction to Inorganic Chemistry or Basic Principles in Chemistry (780109P).

Recommended or required reading:

Kellner, R., Mermet, J.-M., Otto, M., Valcárcel, M. and Widmer, H.M.: Analytical Chemistry, 2nd ed., Wiley-VCH 2004, partly.

Person responsible:

Prof. Paavo Perämäki

780113P: Introduction to Chemistry, 12 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Leena Kaila

Opintokohteen oppimateriaali:

Petrucci, R.H., Harwood, W.S., Herring, F.G. ja Madura, J.D., , 2007

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay780118P	General and Inorganic Chemistry B (OPEN UNI)	5.0 op
780101P	Introduction to Physical Chemistry	7.0 op
780102P	Introduction to Inorganic Chemistry	5.0 op
780109P	Basic Principles in Chemistry	4.0 op

ECTS Credits:

12 credits

Language of instruction:

Finnish

Timing:

1st autumn.

Learning outcomes:

After this course the student is familiar with basic concepts of chemistry as described in international general chemistry curriculum.

Contents:

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

Learning activities and teaching methods:

70 hours of lectures and applications plus 50 hours of exercises, two intermediate examinations or one final examination.

Target group:

Biochemistry, Chemistry, compulsory.

Physical sciences, Mathematical sciences, optional.

Recommended optional programme components:

Upper secondary school chemistry.

Recommended or required reading:

Petrucci, R.H., Harwood, W.S., Herring, F.G. ja Madura, J.D.: General Chemistry: Principles and Modern Applications, 9th ed. (or 7th and 8th ed.), Pearson Prentice Hall, New Jersey, 2007.

Person responsible:

Lecturer L. Kaila

780103P: Introduction to Organic Chemistry, 6 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Koskela, Juha Pekka, Marja Lajunen

Opintokohteen oppimateriaali:

Hart, Harold , , 1999

Hart, Harold , , 1999

Opintokohteen kielet: Finnish

Leikkaavuudet:

780112P Introduction to Organic Chemistry 4.0 op

780103P2 Organic Chemistry I 6.0 op

780108P Basic Course in Organic Chemistry 6.0 op

Voidaan suorittaa useasti: Kyllä

Required proficiency level:

ECTS Credits:

6 credits

Language of instruction:

Finnish

Timing:

1st autumn and 1st spring.

Learning outcomes:

After this course the student is familiar with fundamentals of organic chemistry: structures and properties of organic compounds, basic reactions and basic types of mechanisms.

Contents:

Basic reactions of organic compounds, basic principles of stereochemistry and reaction mechanisms: Addition, eliminations, substitutions, including aromatic electrophilic one, reactions of carbonyl group. Applications.

Learning activities and teaching methods:

52 hours of lectures and applications plus 6 hours of exercises, three intermediate examinations or one final examination.

Target group:

Biochemistry, Chemistry, compulsory.

Physical Sciences, Mathematical Sciences, optional.

Recommended optional programme components:

Upper secondary school chemistry.

Recommended or required reading:

Hart, H., Hart, D.J. and Craine, L.E.: Organic Chemistry: A Short Course, 10th ed. or the newer edition, Houghton Mifflin Boston, 1999; Hart, H., Hart, D.J. and Craine, L.E.: Study Guide & Solutions Book, Organic Chemistry: A Short Course, 10th ed. or the newer edition, Houghton Mifflin Boston, 1999.

Person responsible:

Prof. Marja Lajunen and Dr. Juha P. Koskela

747604S: Introduction to biocomputing, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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:

Students should be 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.

Learning activities and teaching methods:

20 h lectures, student tasks

Grading:

pass/fail

Person responsible:

Andre Juffer

780122P: Introductory Laboratory Course in Chemistry, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Language of instruction:

Finnish.

Timing:

1st autumn or spring.

Learning outcomes:

After this course the student is familiar with safety aspects in laboratory, can handle and use laboratory equipments in experiments. The student knows micro and semi-micro inorganic, analytical methods, is familiar with inorganic or organic synthesis and can analyze the yield and purity..

Contents:

Laboratory safety, bunsen burner, balances, volumetric measures, gravimetric determination, acid-base titration,, pH, titration curves, acid-base indicators, buffer solutions, synthesis and analysis of Fe(II)oxalate, spectrophotometric determination, synthesis of acetyl salicylic acid, TLC.

Learning activities and teaching methods:

40 hours of laboratory work + demonstrations, one final examination.

Target group:

Biochemistry, Biology, Chemistry, Process Engineering, compulsory. Physical Sciences, Geology, Mathematical Sciences, optional.

Recommended optional programme components:

The course Basic Principles in Chemistry (780109P) passed or Biochemistry, Chemistry and teacher education students of Mathematics and Physics: simultaneous participation in the course Introduction to Chemistry (780113P).

Recommended or required reading:

Instruction Book (in Finnish): Kemia perustytöt

Assessment methods and criteria:

Laboratory works and final examination has to be completed within two following terms.

Grading:

Pass/fail

Person responsible:

Prof. M. Lajunen and teaching assistants.

040910S: Laboratory Animal Course For Scientists, 6 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Laboratory Animal Centre

Arvostelu: 1 - 5, pass, fail

Opettajat: Voipio Hanna-marja

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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

Voimassaolo: - 31.07.2013

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Koskela, Juha Pekka

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

2nd autumn.

Learning outcomes:

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

Contents:

Review of methods in organic chemistry and TLC analysis. Producing of spectra, and GC analysis, Aldol condensation, Cannizzaro reaction, preparation of benzoic acid, preparation of cyclohexene, and preparation of 2-nitroresorcinol.

Learning activities and teaching methods:

22 h/week laboratory works.

Target group:

Biochemistry, compulsory.

Recommended optional programme components:

Courses 780101P, 780102P, 780103P, and 780122P passed.

Recommended or required reading:

Clayden, J., Greeves, N., Warren, S. and Wothers, P.: Organic Chemistry, Oxford University Press, 2001.
Laboratory Course Manual.

Person responsible:

Senior assistant Dr. J. Koskela.

740377A: Maturity test (B.Sc. degree), 0 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 credits

Timing:

BSc yr3 spring

Contents:

Maturity test (B.Sc.) will be written in the topic of B.Sc. thesis. In the test student proves to command both the subject of B.Sc thesis and native language.

Grading:

pass/fail

740672S: Maturity test (M.Sc. degree), 0 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Timing:**

M.Sc. yr2

Contents:

Will be written in context to Pro gradu thesis. In the test student must show a good command of both language skills and their field of Pro gradu thesis. If student's native language is not Finnish or Swedish Faculty of Science will define language in the test.

Grading:

pass/fail

740149P: Metabolism I, 4 op**Opiskelumuoto:** Basic Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**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

740146P Metabolism I 6.0 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

spring

Learning outcomes:

Students should be able to understand in detail how cells transform energy for their needs.

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.

Learning activities and teaching methods:

The module is arranged into 30 h of lectures and problem-based exercises

Target group:

minor subject students

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

Other information:

This module is the same as Metabolism I (740146P), except that it contains no practical component

740146P: Metabolism I, 6 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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 should be able to understand in detail how cells transform energy for their needs. Students of the 6 op course will also learn some basic experiments and analyses concerned with energy metabolism; topics include glycogen, citric acid cycle and digestive enzymes.

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.

Learning activities and teaching methods:

The module (6 credits) is arranged into 30 h of lectures and problem-based exercises and 40 h of laboratory work

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

740367A: Metabolism II, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: Finnish

Leikkaavuudet:

740375A Metabolism II 4.0 op

ECTS Credits:

6 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr3 autumn

Learning outcomes:

Students should be able to understand in detail how cells use various small and large molecules, how cells synthesize and degrade metabolites for their needs, and how metabolic network is connected and integrated. Students of the 6 op course will additionally learn through experimentation the photosynthetic pigments as well as purification of mitochondrial components from the cell

Contents:

Metabolism II is a module that extends many of the fundamentals that were introduced in the module Metabolism I. It will be seen how the metabolic pathways that were examined separately will be connected to each other and regulated. Some chemical mechanisms of pathways as well as ways to supply precursors for the main stream pathways will be handled as well as the biosynthesis and degradation of central metabolites and structural molecules of the cell, like amino acids and nucleotides. Special aspects of metabolism, like tissue specificity and physiological states, will also be studied. Photosynthesis will be studied in detail and principles of cellular traffic will be introduced.

Learning activities and teaching methods:

The module (6 credits) is arranged into 30 h of lectures and problem-based exercises and 40 h of laboratory work.

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

740375A: Metabolism II, 4 op

Voimassaolo: - 31.07.2012

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: Finnish

Leikkaavuudet:

740367A Metabolism II 6.0 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

autumn

Learning outcomes:

Students should be able to understand in detail how cells use various small and large molecules, how cells synthesize and degrade metabolites for their needs, and how metabolic network is connected and integrated.

Contents:

Metabolism II is a module that extends many of the fundamentals that were introduced in the module Metabolism I. It will be seen how the metabolic pathways that were examined separately will be connected to each other and regulated. Some chemical mechanisms of pathways as well as ways to supply precursors for the main stream pathways will be handled as well as the biosynthesis and degradation of central metabolites and structural molecules of the cell, like amino acids and nucleotides. Special aspects of metabolism, like tissue specificity and physiological states, will also be studied. Photosynthesis will be studied in detail and principles of cellular traffic will be introduced.

Learning activities and teaching methods:

The module is arranged into 30 h of lectures and problem-based exercises

Target group:

Minor subject students

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

Other information:

This module is the same as Metabolism II (740367A), except that it contains no practical component

740363A: Microbiology, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Johanna Panula-Perälä

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:

Finnish

Timing:

B.Sc. yr2 autumn

Learning outcomes:

After successful completion of the course, the student should:

- be able to define the typical features of bacteria, archaea, fungi and virus and give examples of cell structure for the different groups of microorganisms
- be able to categorise microorganisms according to their energy metabolism and carbon source preferences
- understand the basics of microbial growth, enrichment, culture and growth control both in the environment and in contained culture
- be able to explain the essential role of microorganisms as decomposers in the cycle matter
- be able to apply his 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.

Learning activities and teaching methods:

24 hours lecture and 60 hours laboratory exercises in cooperation with the Bioprocess Engineering Laboratory.

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 (2008) Brock biology of microorganisms, 12th ed. Prentice Hall International. Microbiology laboratory exercises, Dept. Biochemistry (2010).

Grading:

1-5/fail

Person responsible:

Tomi Hillukkala

740374A: Microbiology, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Johanna Panula-Perälä

Opintokohteen kielet: Finnish

Leikkaavuudet:

740363A Microbiology 6.0 op

740322A Microbiology 3.0 op

ECTS Credits:

3 credits

Language of instruction:

Finnish

Timing:

autumn

Learning outcomes:

After successful completion of the course, the student should:

- be able to define the typical features of bacteria, archaea, fungi and virus and give examples of cell structure for the different groups of microorganisms
- be able to categorise microorganisms according to their energy metabolism and carbon source preferences
- understand the basics of microbial growth, enrichment, culture and growth control both in the environment and in contained culture
- be able to explain the essential role of microorganisms as decomposers in the cycle matter
- be able to apply his 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.

Target group:

Minor subject students

Recommended or required reading:

M. Salkinoja-Salonen (ed.) (2002) Mikrobiologian perusteita, Helsingin yliopisto; M.T. Madigan, J. M. Martinko, J. Parker (2003) Brock biology of microorganisms, 10th ed. Prentice Hall International.

Grading:

1-5/fail

Person responsible:

Tomi Hillukkala

Other information:

This module is the same as Microbiology (740363A) except that it contains no practical component.

740361A: Molecular Biology I, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

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

Timing:

B.Sc. yr2 autumn

Learning outcomes:

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

Contents:

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

Learning activities and teaching methods:

22 h lectures, 80 h lab, theoretical exercises

Recommended or required reading:

Strachan, Read: Human Molecular Genetics 3. Garland Science, 2004. Mathews, van Holde, Ahern: Biochemistry (3rd edition). Addison Wesley Longman, Inc., latest edition

Grading:

1-5/fail. Attendance on lectures 20%, homeworks 30%, reports from practicals 10%, final exam 40 %

740373A: Molecular Biology I, 4 op**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

740361A Molecular Biology I 8.0 op

740318A Molecular Biology 4.0 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

autumn

Learning outcomes:

After this course students should understand modern molecular biology methods.

Contents:

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

Learning activities and teaching methods:

22 h lectures, plus exercises

Target group:

minor subject students

Recommended or required reading:

Kirjallisuus Strachan, Read: Human Molecular Genetics 3. Garland Science, 2004. Mathews, van Holde, Ahern: Biochemistry (3rd edition). Addison Wesley Longman, Inc., latest edition

Grading:

1-5/fail. Attendance on lectures 20%, homeworks 40%, final exam 40 %

040120A: Molecular Development Biology, 2 op**Voimassaolo:** 01.08.2005 -**Opiskelumuoto:** Intermediate Studies**Laji:** Course

Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vainio Seppo
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

744621S: Molecular biology II, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biochemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Alexander Kastaniotis
Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

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

Contents:

This module provides a "real-life" approach to practical molecular biology, including DNA technology, protein analysis, cloning strategies, generation of transgenic mice, etc. It comprises a small number of revision lectures, but it is primarily based on complex problem solving based exercises. 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.

Learning activities and teaching methods:

12 h seminars, plus excercises and a student presentation

Grading:

pass/fail

Person responsible:

Alexander Kastaniotis

743655S: Neurobiology, 4 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Biochemistry
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 should have acquired:

- an understanding of the general structural and functional organisation of the mammalian nervous system, and of the developmental and functional differentiation, and roles of its cellular components.
- a more detailed knowledge of selected areas of the neurosciences in which major research drives are currently undertaken.
- a background knowledge of Neurobiology sufficient 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 - Mouse mutant models of nerve disorders.

The module includes an article analysis in small groups and presentation. A final examination and the active participation and performance in article analysis exercises will contribute to the final mark.

Learning activities and teaching methods:

8-10 h lectures and 5-7 h group work (depending on the number of students).

Recommended optional programme components:

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

Grading:

1-5/fail

Person responsible:

Anthony Heape

740072Y: Orientation, 1 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

740076Y Orientation 2.0 op

ECTS Credits:

1 credit

Timing:

B.Sc. yr1 autumn

Contents:

Introduction of the new students to university, academic studies and academic learning environment and give information about goal and content of the degree programme in biochemistry.

Learning activities and teaching methods:

10-20 h visits, discussion, group work

Grading:

pass/fail

Person responsible:

Amanuensis and small group tutors

744617S: Orientation to research work, 0 - 20 op

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

12 - 20 credits (for Int MSc in Protein science and Biotechnology line 12-18 credits)

Language of instruction:

English

Timing:

MSc yr 1

Learning outcomes:

After this course student has gained experience of practical work done in research groups.

Contents:

This module provides an introduction to research work via the active integration of students into research groups and/or via one to two week advanced practical courses. The integration into groups can be either full-time or part-time research work, with 1.5 credits being awarded for each full-time week equivalent worked. A maximum of 6 credits can be awarded for working in one research group. The research groups do not need to be in the Department of Biochemistry, University of Oulu, but advance permission should be sought if the research group is not part of the University of Oulu.

Grading:

pass/fail

Person responsible:

Jari Heikkinen

740145P: Physical Biochemistry, 6 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: André Juffer

Opintokohteen kielet: English

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

B.Sc. yr1 spring

Learning outcomes:

After completion of the course, students should be able to

- understand the relevance of theoretical concepts to the biosciences.
- understand where various equations of physical biochemistry come from.
- understand the link between theory and experiment.
- to 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.

Learning activities and teaching methods:

24 h lect, 8 h lab., plus exercises

Recommended or required reading:

Price et al., Principles and problems in physical chemistry for biochemists, Third edition, Oxford University Press, Oxford, 2001

Grading:

1-5/fail

Person responsible:

André Juffer

740371A: Physiological Biochemistry, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Kalervo Hiltunen

Opintokohteen oppimateriaali:

Murray, R.K., , 2006

Opintokohteen kielet: English

Leikkaavuudet:

742627S Physiological biochemistry 4.0 op

ECTS Credits:

4 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr3 spring

Learning outcomes:

Upon completion student should be able to:

- o Understand the tasks of different organs in metabolism
- o Understand the basics of regulation of metabolism
- o Understand connection between the nutrition and regulation of metabolism

Contents:

Aim of the course is to familiarize students with specific characteristic of biochemistry of human body, the roles of organs and basics of regulation of human metabolism. The following topics will be addressed: endocrinology, the biochemistry of a digestive tract, muscles, fat tissue, kidney and liver. A compulsory laboratory experiment about the regulation of lipolysis is included.

Learning activities and teaching methods:

18 h lect, 8 h lab

Recommended or required reading:

Murray, R.K.: Harper's illustrated bio-chemistry (27th edition) 2006, partly

Grading:

1-5/fail

Person responsible:

Kalervo Hiltunen

743694S: Pro gradu experimental work in molecular and cellular biology, 28 op

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

ECTS Credits:

28 credits

Timing:

M.Sc. yr1-2

Learning outcomes:

On successful completion of this course, the student has

- Increased appreciation of how research leads to knowledge and how technologies may be applied/adapted to address a research question
- Developed abilities to work independently and as part of a team - self motivation, diplomacy, planning and organizational skills and time management.
- Developed abilities to identify and solve practical problems, to design and execute experiments and how to record and critically evaluate data.

Contents:

This module provides an extensive, 6 month, project in a research group. The experimental work can be started after 30 op of Master studies have been completed. Students are responsible for finding a suitable research group in which they wish to undertake the Pro Gradu work. Students should produce a short (typically 2 page) study plan detailing the proposed content of their Pro Gradu work, supervisor(s) and start date which must be approved before they start work. The Pro Gradu thesis is based only on the work done during the first 6 months of work by the student on the project, except in cases of mitigating circumstances. The work may be un-dertaken in the research groups of department of Biochemistry or in any other suitable research group in Finland or abroad.

Learning activities and teaching methods:

6 months project in a research group

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

747691S: Pro gradu experimental work in protein science and biotechnology, 28 op

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

ECTS Credits:

28 credits

Timing:

M.Sc. yr1-yr2

Learning outcomes:

On successful completion of this course, the student has

- Increased appreciation of how research leads to knowledge and how technologies may be applied/adapted to address a research question
- Developed abilities to work independently and as part of a team - self motivation, diplomacy, planning and organizational skills and time management.
- Developed abilities to identify and solve practical problems, to design and execute experiments and how to record and critically evaluate data.

Contents:

This module provides an extensive, 6 month, project in a research group. The experimental work can be started after 30 op of Master studies have been completed. Students are responsible for finding a suitable research group in which they wish to undertake the Pro Gradu work. Students should produce a short (typically 2 page) study plan detailing the proposed content of their Pro Gradu work, supervisor(s) and start date which must be approved before they start work. The Pro Gradu thesis is based only on the work done during the first 6 months of work by the student on the project, except in cases of mitigating circumstances. The work may be un-dertaken in the research groups of department of Biochemistry or in any other suitable research group in Finland or abroad.

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

743695S: Pro gradu thesis in molecular and cellular biology, 20 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Biochemistry

Arvostelu: A,B,N,C,M,EX,L

Opettajat: Tuomo Glumoff

Opintokohteen kielet: English

ECTS Credits:

20 credits

Timing:

M.Sc. yr2

Learning outcomes:

On successful completion of this course, the student has

- Developed skills in retrieving, appraising critically and integrating information.
- Developed skills in communicating science and in making and defending scientific arguments.

Contents:

The Pro gradu thesis (typically around 50-60 pages long) is based on the experimental work undertaken by the student and the contextualization of the research and the results based on the published literature in the field. For detailed instructions see <http://www.biochem oulu.fi/>.

747692S: Pro gradu thesis in protein science and biotechnology, 20 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: English

ECTS Credits:

20 credits

Timing:

M.Sc. yr2

Learning outcomes:

On successful completion of this course, the student has

- Developed skills in retrieving, appraising critically and integrating information.
- Developed skills in communicating science and in making and defending scientific arguments.

Contents:

The Pro gradu thesis (typically around 50-60 pages long) is based on the experimental work undertaken by the student and the contextualization of the research and the results based on the published literature in the field. For detailed instructions see <http://www.biochem oulu.fi/>.

746606S: Project work in Biochemistry, 1,5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Language of instruction:

English

Contents:

Research work done in the Department of Biochemistry 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.

Target group:

This module is meant for exchange students only

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

740364A: Protein Chemistry I, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Haapalainen

Opintokohteen kielet: English

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

B.Sc. yr1 autumn-yr1 spring

Learning outcomes:

Upon successful completion students should have:

- An understanding of the relevance of protein structure, including post-translational modification, to protein function
- An awareness of the techniques available to purify proteins and to study protein function and an appreciation of the applications and limitations of these techniques
- The ability to 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 more detailed information on the chemistry of proteins. Topics covered include protein purification, reversible and irreversible covalent modifications of proteins, protein degradation, an introduction to the protein folding problem, protein structure analysis, basic enzyme catalysis mechanisms and co-enzymes. The module includes student presentations and the final examination is problem solving based. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

Learning activities and teaching methods:

30 h lectures, 64 h lab, exercises

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock ja Antti Haapalainen

744620S: Protein chemistry II, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Kursula

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

the students are able to:

- read and understand professional literature dealing with advanced techniques of protein analysis
- plan the purification of a given protein in large scale
- present 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.

Learning activities and teaching methods:

12 h seminars, plus exercises and a student presentation

747601S: Protein production and analysis, 8 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**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 should have:

- An understanding of the relevance of protein structure, including post-translational modification, to protein function
- An awareness of the techniques available to purify proteins and to study protein function and an appreciation of the applications and limitations of these techniques
- The ability to 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.

Learning activities and teaching methods:

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

Target group:

Int MSc in Prot Sci

Recommended optional programme components:

Previous studies A BSc in biochemistry or a closely related subject

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Other information:

740368A: Radiation and Safety, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

740320A Radiochemistry and Radiation Safety 4.5 op

740339A Laboratory course in isotope techniques 1.5 op

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr3 autumn

Learning outcomes:

Upon completion the students should be able to

- understand the character of ionizing radiation
- know biological effects of radiations
- work safely in the isotope laboratory
- know legislation and regulatory guides on radiation safety

Contents:

This course is composed of two lecture items, radiochemistry and radiation legislation, and practical course. Radiochemistry course will describe nature of radioactivity, decay types, interaction of radiation with matter and biological effects of ionizing radiation. In the legislation part radiation law and regulatory guides on radiation safety will be examined. During the practical course students will be familiarized with the use of radioisotopes, radiation protection and radiation safety rules. They will also be familiarized with some typical ways to use radiation in research work. Passing the lecture part not less than 3 (and the legislation part at least 3) and completion of practical course will qualify to act as a radiation safety officer (radiation law 592/91 18§) in the following fields of competence: 1) Use of unsealed sources in industry, research and education, 2) Use of sealed sources and X-ray appliances in industry, research and education, 3) Trade in radioactive substances.

Learning activities and teaching methods:

10 h lectures, self study, 40 h lab

Recommended or required reading:

Lecture handout, Radiation act and Radiation degree, Regulatory Guides on radiation safety

Grading:

1-5/fail

Person responsible:

Sakari Kellokumpu

747606S: Structural enzymology, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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:

Students should be able to understand

- The methods that are used to crystallize proteins
- The basic concepts of the transition state theory
- The relation between reaction rates and free energy barriers
- Enzyme reaction mechanisms
- The concepts of catalytic bases and acids
- Active site strain
- The importance of active site electrostatics
- 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 chymotrypsine 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.

Learning activities and teaching methods:

20 h lectures and seminars

Grading:

pass/fail

Person responsible:

Rik Wierenga

901004Y: Swedish, 2 - 3 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Opintokohteen kielet: Swedish

Leikkaavuudet:

901035Y Second Official Language (Swedish), Oral Skills 1.0 op

901034Y Second Official Language (Swedish), Written Skills 1.0 op

ay901004Y Swedish (OPEN UNI) 2.0 op

Ei opintojaksokuvauksia.

744619S: Systems biology, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: English

ECTS Credits:

4 credits

Language of instruction:

English

Timing:

M.Sc. 1st-2nd spring

Learning outcomes:

Students will be better able to see the cell as an ensemble of structural and functional parts, and the course helps them to place their current knowledge on cellular, molecular and structural biology into a general view. They are also expected to further strengthen their ability to think 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 discussed in relation to available research techniques, techniques of the future, applications, research targets, as well as from the philosophical point of view including applicability of the systems theory in biosciences.

Learning activities and teaching methods:

The module consists of 16 h of lectures/discussions/case studies, 3h of computing exercises, and a presentation by every student on a recent work employing systems biology or emphasizing a central methodological issue.

Recommended optional programme components:

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

Assessment methods and criteria:

Study diaries or written course reviews (voluntary) will be assessed for a mark on scale 1 to 5. Otherwise marking will be pass/fail. There is no exam and thus presence on certain amount of the course is compulsory.

Person responsible:

Tuomo Glumoff

740074Y: Tutoring/confidential posts, 1,5 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: Finnish

ECTS Credits:

1.5 credits

Contents:

For this study a student acts as a tutor for a group of new students, as a member of Departmental council or as a member of Working group on development of teaching.

Learning activities and teaching methods:

10-20 h tutoring of a small group, activity in Departmental council or activity in Working group on development of teaching. Optional

Grading:

pass/fail

Person responsible:

Amanuensis

744623S: Yeast genetics, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

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:

6 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2 spring

Learning outcomes:

As a result of participation in this course, students should

- have acquired a basic knowledge of yeast genetics and physiology
- understand basic principles of using the yeast model organism to address fundamental genetic and cell biological problems
- (practical course) be familiar with a 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 credits. 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 and 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 10-15 people, and preference will be given to students who performed well in the lecture course (3 credits).

Learning activities and teaching methods:

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

Grading:

1-5/fail

Person responsible:

Alexander Kastaniotis