

Opasraportti

LuTK # Biochemistry (2012 - 2013)

Biochemistry Degree Program 2012-2013

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

The education of biochemists was changed in autumn 2005 to a new degree system across the EU. The first degree is a 3-year candidate degree (BSc, Bachelor of Science) followed by a 2-year master degree (MSc, Master of Science). The purpose of the change 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 2008. Since autumn 2007, the Department of Biochemistry has organized a Master Degree Programme in Protein Science and Biotechnology for international students.

The Mission of the Department of Biochemistry is based on the fact that current and high level teaching cannot be given without strong basic research. This can be seen in the operational principles of the department. Innovative specialists will be needed in the field. Teaching is seen as an entity where high quality basic and doctoral education, including post doctoral training abroad, is a fundamental part of the departmental structure.

Post graduate training has an important role in the department. Research work starts at the end of MSc phase when a student is doing his Pro gradu project with research work towards a PhD being started after this. Many research groups of international level are operating in the department and about 40 PhD students are working here at present. Post graduate training involves high level training and is linked to clear research projects.

Most of the students who have graduated from the Department of biochemistry, University of Oulu are working in universities within research and teaching, while 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 licentiate 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

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

The recommended order for courses for a bachelor degree is presented in the figure. 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) and presentations. A report cannot be a copy of the other text and all citations from other texts or figures must be clearly presented as references. Copying, using of the text of other students and other forms of plagiarism are forbidden and will lead to punishment and rejection of the report.

Yr1 autumn	Yr1 spring	Yr2 autumn	Yr2 spring	Yr3 autumn	Yr3 spring
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BIOCHEMISTRY

Orientation		Molecular biology I	Cellular biology	Cellular communication	
Biomolecules for biochemists		Metabolism II	Physical biochemistry	Introduction to Immunology*	Physiological biochemistry*
Biochemical methodologies I					
	Metabolism I	Protein Chemistry I		Essay (B.Sc. thesis)	Radiation and safety*
	Microbiology				Maturity test
	Transferable skills for biochemists				Final examination
					Optional studies

LANGUAGE CENTER

English for biochemists I

Swedish

BIOLOGY

Cell biology

Concepts of genetics

Laboratory Animal Course*

Animal physiology *

Developmental biology-histology *

CHEMISTRY

General and inorganic chemistry I

Organic chemistry I*

Introduction to analytical chemistry

Laboratory course in organic chemistry I*

General and inorganic chemistry II

Introductory lab. course in chemistry

Introduction to organic chemistry

MATH. SCIENCES

Basic methods in statistics I

SCIENCE AND TECHNOLOGY LIBRARY TELLUS

Introduction to information

Retrieval*

* Recommended optional studies

Optional studies

BSc degree in biochemistry includes 48 credits of optional studies. Recommended optional courses are put together in the time table so that they do not clash with obligatory courses. However, students are free to select other university courses either in Finland or abroad. The content of courses must not be too similar to obligatory courses. Courses taken outside University of Oulu should be agreed with the departmental amanuensis in advance. BSc studies must include a minor subject that comprises at least 25op of basic / intermediate studies. Students are advised to do the minor subject in either chemistry or biology (compulsory studies in these subjects can be included in the 25op total)

Biochemistry as a minor subject

Biochemistry courses can be attended freely by students from other departments with only one restriction: We reserve right to not allow students on the course if the work places available in the laboratory or equipment available are insufficient.

All courses and exams organized by department must be subscribed to via WebOodi (<https://weboodi oulu.fi/oodi>) before the relevant 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

The time and place of examinations are informed via timetables in the home page of department (<http://www.biochem oulu.fi>). Students must subscribe to exams via WebOodi (<https://weboodi oulu.fi/oodi>) before the relevant deadline. The grading scale is 0-5. The lowest passing grade is 1. Some courses are graded pass/fail. Three exams are organized for each course. A course must be passed during the given time, not in another year.

The 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

The final grade will be given by Tuula Koret (BK228) or Faculty of Science (YL132)

Lines and degrees

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

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

In addition, the Department of Biochemistry offers a Master´s Degree Programme in Protein Science and Biotechnology for international students, in which curriculum differs slightly from the Protein Science and Biotechnology MSc.

Bachelor of Science (Biochemistry)

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

- apply fundamental knowledge in biochemistry and ancillary subjects and follow and evaluate developments in that field;
- apply scientific thinking and to use scientific methods;
- relate to and discuss the high public awareness and impact on society of biochemistry;
- complete responsible and goal-oriented teamwork and in individual work;
- capability to apply the acquired knowledge in working life;
- communicate in Finnish and Swedish as stipulated in the Degree Statute, as well as proficiency in English;
- demonstrate 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	7 credits
Basic studies in Biochemistry	30 credits
Intermediate studies in Biochemistry	56 credits
Maturity test	0 credits

Chemistry	21 credits
Biology and statistic	18 credits
Optional studies	48 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:

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

A Master degree consists of the following elements:

M.Sc. Degree

Obligatory advanced courses	61-77 credits
Maturity test	0 credits
Optional studies	43-51 credits
Total at least	120 credits

STUDIES FOR B.Sc. DEGREE

General studies 7 credits	credits	Semester
Orientation (740072Y)	1	Autumn yr 1
English for biochemists I (902100Y)	3	Autumn yr 1-Spring yr 1
Swedish (901004Y)	3	Autumn yr 3
Basic studies in biochemistry 30 credits		
Biomolecules for biochemists (740143P)	8	Autumn yr 1-Spring yr 1
Biochemical methodologies I (740144P)	8	Autumn yr 1-Spring yr 1
Metabolism I (740146P)	6	Spring yr 1
Physical biochemistry (740145P)	6	Spring yr 1
Transferable skills for biochemists (7400xxP)	2	Spring yr 1
Intermediate studies in biochemistry 56 credits		
Molecular biology I (740361A)	8	Autumn yr 2
Mikrobiology (740363A)	6	Autumn yr 2
Protein chemistry I (740364A)	8	Autumn yr 2
Cellular biology (740362A)	6	Spring yr 2
Metabolism II (740367A)	6	Autumn yr 2
Essay (B.Sc. thesis) (740376A)	10	Autumn yr 3
Cellular communication (740366A)	6	Autumn yr 3
Maturity test (740377A)	0	Spring yr 3
Final examination (740372A)	6	Spring yr 3
Chemistry 21 credits		

General and inorganic chemistry I (780114P)	6	Autumn yr 1
General and inorganic chemistry II (780115P)	6	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

Biology and statistic 18 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

Recommended optional studies

Radiation and safety (740368A)	5	Spring yr 3
Introduction to immunology (740379A)	3	Autumn yr 3
Virology (7403xxA) (starts 2015)	3	Spring yr 3
Physiological biochemistry (740371A) *	4	Spring yr 3
Animal physiology, lectures (751388A) *	4	Spring yr 2
Animal physiology, exercises (755318A)	4	Autumn yr 3
Developmental biology-histology, lectures (751367A)	4	Spring yr 3
Developmental biology-histology, exercises (755317A)	5	Spring yr 3
Introduction to analytical chemistry (780111P)	4	Spring yr 2
Laboratory course in organic chemistry I (780332A)	4	Autumn yr 3
Organic chemistry I	6	Autumn yr 2
Laboratory animal course (040910A)	6	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

Courses for minor subject students

	credits	semester
Biomolecules (740148P)	5	Autumn-Spring
Biomolecules for Bioscientists (740147)	8	Autumn-Spring
Metabolism I (740149A)	4	Spring
Microbiology (740374A)	3	Spring
Molecular biology I (740373A)	4	Autumn

STUDIES FOR M.Sc.DEGREE

Protein Science and Biotechnology (120 credits)

Compulsory courses	credits	Sen
Protein chemistry II (744620S)	3	Auti
Molecular biology II (744621S)	3	Auti
Biochemical methodologies II (747608S)	8	Auti
English for biochemists III (902122Y)	3	Spr
Orientation to research work (744617S) / Orientation to biochemical work (744624S)	12-20	Auti
Pro gradu experimental work in protein science and biotechnology (747691S)	28	

Pro gradu thesis in protein science and biotechnology (747692S)	20	
Maturity test (M.Sc. degree) (740672S)	0	
Optional specialist courses (a minimum of 4 of these courses must be taken)		
Basic aspects of protein crystallographic methods (747605S)	3	Autu
Structural enzymology (747606S)	3	Spr
Biochemistry of protein folding (747602S)	2,5	Spr
Systems biology (744619S)	4	Autu
Bioinformatics (747603S)	2,5	Spr
Biological NMR spectroscopy (784637S, Dept. of Chemistry)	3	Spr
Introduction to biocomputing (747604S)	3	Autu
Introduction to membrane proteins I (747609S)	3	Spr
Introduction to membrane proteins II (747610S)	2,5	Autu
Other optional courses		
Dissertation (744618S)	18	
Scientific presentation (744625S)	1-2	
Final examination in protein science and biotechnology (747693S)	9	
Yeast genetics (744623S)	3-6	Spr
Advanced information skills (300002M, Science and Technology library Tellus)	1	
Bioreactor technology (488304S, Bioprocess Engineering Laboratory)	6	Autu
Advanced course for biotechnology (488305S, Bioprocess Engineering Laboratory)	5	Spr
Optional courses at any university	0-12	

Any other MSc level course offered by the Department of Biochemistry

Molecular and cellular biology (120 credits)

Obligatory courses	credits	Sen
Protein chemistry II (744620S)	3	Autu
Molecular biology II (744621S)	3	Autu
English for biochemists III (902122Y)	3	Spri
Orientation to research work (744617S) / Orientation to biochemical work (744624S)	12-20	Autu
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	Autu
Systems biology (744619S)	4	Autu
Neurobiology (743655S)	4	Spri
Bioinformatics (747603S)	2,5	Spri
Biochemistry of cell organells (743659S)	3	Autu
Cell cycle, DNA replication and repair (743658S)	2,5	Spri
Tumor cell biology (743657S)	3	Spri
Other optional courses		
Biochemical methodologies II (747608S)	8	Autu
Dissertation (744618S)	18	

Virology (743xxS) (starts 2015)		
Scientific presentation (744625S)	1-2	
Introduction to immunology (743660S)	3	Aut
Final examination in molecular and cellular biology (743696S)	9	
Yeast genetics (744623S)	3-6	Spr
Basic aspects of protein crystallographic methods (747605S)	3	Aut
Structural enzymology (747606S)	3	Spr
Biochemistry of protein folding (747602S)	2,5	Spr
Advanced information skills (300002M, Tiedekirjasto Tellus)	1	
Biological NMR spectroscopy (784637S, Dept. of Chemistry)	3	Spr
Introduction to biocomputing (747604S)	3	Aut
Introduction to membrane proteins I (747609S)	3	Spr
Introduction to membrane proteins II (747610S)	2,5	Aut
Genetic transformation of plants (756625S) (Dept. of Biology)	4	Aut
Secondary metabolism of plants (756618S)(Dept. of Biology)	4	Spr
Plant hormones (756627S)(Dept. of Biology)	4	Spr
Optional courses at any university	0-12	
Any other MSc level course offered by the Department of Biochemistry		

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

Obligatory courses	credits	Semester
Protein production and analysis (747601S)	8	Autumn yr1

Biochemical methodologies II (747608S)	8	Autumn yr1
Orientation to research work (744617S) / Orientation to biochemical work (744624S)	12-18	Spring yr 1
Pro gradu experimental work in protein science and biotechnology (747691S)	28	
Pro gradu thesis in protein science and biotechnology (747692S)	20	
Maturity test (M.Sc. degree) (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
Biochemistry of protein folding (747602S)	2,5	Spring
Systems biology (744619S)	4	Spring
Bioinformatics (747603S)	2,5	Spring
Introduction to biocomputing (747604S)	3	Autumn
Introduction to membrane proteins I (747609S)	3	Spring
Introduction to membrane proteins II (747610S)	2,5	Autumn
Biological NMR spectroscopy (784637S) (Dept. of Chemistry)	3	Spring
Optional courses		
Dissertation (744618S)	18	
Scientific presentation (744625S)	1-2	
Final examination in protein science and biotechnology (747693S)	9	
English for biochemists III (902122Y)	3	Spring yr 1

Yeast genetics (744623S)	3-6	Spring
Information Skills / Sources of Scientific Information (030008P) Science and Technology library Tellus)	1	
Bioreactor technology (488304S) (Bioprocess Engineering Laboratory)	6	Autumn
Advanced course for biotechnology (488305S) (Bioprocess Engineering Laboratory)	5	Spring
Optional courses at any university	0-12	
Any other MSc level course offered by the Department of Biochemistry		

Optional courses at any universities

Up to 12 credits of courses can be taken from other suitable courses taught at any university. 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: +358-8-0294 48 1141, tel +358-294 48 1200, http://www.biochem.oulu.fi/index_e.html

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

Tutkintorakenteet

B.Sc. degree, Biochemistry

Tutkintorakenteen tila: published

Lukuvuosi: 2012-13

Lukuvuoden alkamispäivämäärä: 01.08.2012

General studies (7 op)

General studies are obligatory for all students. For biochemists the Swedish course is 3 credits.

902100Y: English for Biochemists 1, 3 op

740072Y: Orientation, 1 op

901004Y: Swedish, 2 - 3 op

Basic studies in biochemistry (30 op)

Basic studies are obligatory for all students.

740144P: Biochemical Methodologies I, 8 op
 740143P: Biomolecules for Biochemists, 8 op
 740146P: Metabolism I, 6 op
 740145P: Physical Biochemistry, 6 op
 740150P: Transferable skills for biochemists, 2 op

Intermediate studies in biochemistry (56 op)

Intermediate studies are obligatory for all students.

740362A: Cellular Biology, 6 op
 740366A: Cellular Communication, 6 op
 740376A: Essay (B.Sc. thesis), 10 op
 740372A: Final Examination, 6 op
 740377A: Maturity test (B.Sc. degree), 0 op
 740367A: Metabolism II, 6 op
 740363A: Microbiology, 6 op
 740361A: Molecular Biology I, 8 op
 740364A: Protein Chemistry I, 8 op

Chemistry (21 op)

The chemistry courses below are obligatory for all students.

780114P: General and Inorganic Chemistry I, 6 op
 780115P: General and Inorganic Chemistry II, 6 op
 780103P: Introduction to Organic Chemistry, 6 op
 780122P: Introductory Laboratory Course in Chemistry, 3 op

Biology and statistic (18 op)

The courses below are obligatory for all students. Within the Concepts of genetics course biochemists take parts 1 and 3 (4 credits).

806109P: Basic Methods in Statistics I, 9 op
 750121P: Cell biology, 5 op
 753124P: Concepts of genetics, 4 - 7 op

Optional studies (vähintään 48 op)

BSc degree in biochemistry includes 48 credits of optional studies. Recommended optional courses are put together in the time table so that they do not clash with obligatory courses. However, students are free to select other university courses either in Finland or abroad. The content of courses must not be too similar to obligatory courses. Courses taken outside University of Oulu should be agreed with the departmental amanuensis in advance. BSc studies must include a minor subject that comprises at least 25op of basic / intermediate studies. Students are advised to do the minor subject in either chemistry or biology (compulsory studies in these subjects can be included in the 25op total).

Recommended optional studies

Other optional studies

International MSc in Protein Science and Biotechnology

Tutkintorakenteen tila: published

Lukuvuosi: 2012-13

Lukuvuoden alkamispäivämäärä: 01.08.2012

Obligatory courses (76 - 82 op)

Obligatory courses

- 747608S: Biochemical methodologies II, 8 op
- 740672S: Maturity test (M.Sc. degree), 0 op
- 747691S: Pro gradu experimental work in protein science and biotechnology, 28 op
- 747692S: Pro gradu thesis in protein science and biotechnology, 20 op
- 747601S: Protein production and analysis, 8 op

Orientation

- 744624S: Orientation to biochemical work, 0 - 20 op
- 744617S: Orientation to research work, 0 - 20 op

Optional specialist courses (at least 4 must be taken)

- 747605S Basic aspects of protein crystallographic methods 3 ECTS, autumn
- 747606S Structural enzymology 3 ECTS, spring
- 747611S Biochemistry of protein folding 3 ECTS, spring
- 744619S Systems biology 4 ECTS, autumn
- 747603S Bioinformatics 2.5 ECTS, spring
- 747604S Introduction to biocomputing 3 ECTS, autumn
- 747609S Introduction to membrane proteins I 3 ECTS, spring
- 747610S Introduction to membrane proteins II 2.5 ECTS, autumn
- 784637S Biological NMR spectroscopy (Dept. of Chemistry) 3 ECTS, spring

Optional courses

In addition to following courses students are allowed to take any listed optional course in any MSc in biochemistry line (see general information in Biochemistry course catalogue in WebOodi) . The sum of credits of obligatory, optional specialist and optional courses must be at least 108 ECTS cr.

744618S Dissertation 18 ECTS

744625S Scientific presentation 1-2 ECTS

747693S Final examination in protein science and biotechnology 9 ECTS

902122Y English for biochemists III, 3 ECTS, yr1 spring

744623S Yeast genetics 3-6 ECTS, spring

030008P Information Skills / Sources of Scientific Information 1 ECTS (Science and Technology library Tellus)

488304S Bioreactor technology (Bioprocess Engineering Laboratory) 6 ECTS, autumn

488305S Advanced course for biotechnology (Bioprocess Engineering Laboratory), 5 ECTS, autumn

Optional course at any university (0-12 ECTS cr)

Up to 12op of courses can be taken from other suitable courses taught at any university. 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.

Studies taken / planned to be taken outside of University of Oulu can be added to PSP only after they have been accepted and registered to Oodi. These studies will appear in "Other completed courses" -tab where these can be picked up and add to PSP.

M.Sc. degree, Biochemistry (Molecular and cellular biology)

Tutkintorakenteen tila: published

Lukuvuosi: 2012-13

Lukuvuoden alkamispäivämäärä: 01.08.2012

Compulsory courses (69 - 77 op)

H325421: Compulsory courses - MSc, molecular and cellular biology, 69 op

Obligatory courses

744620S: Protein chemistry II, 3 op

744621S: Molecular biology II, 3 op

902101Y: English for Biochemists 2, 3 op

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

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

740672S: Maturity test (M.Sc. degree), 0 op

Orientation to research work: work done in an academic or industrial research group. Orientation to biochemical work: work done in a non research group environment. The sum of credits of both courses must be 12-20 ECTS.

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

744624S: Orientation to biochemical work, 0 - 20 op

Optional specialist courses (at least 4 must be taken) (11 - 22 op)

H325424: Optional specialist courses - MSc, molecular and cellular biology, 11 - 22 op

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

743604S: Biochemistry of inherited diseases, 3 op

744619S: Systems biology, 4 op

743655S: Neurobiology, 4 op

747603S: Bioinformatics, 2,5 op

743659S: Biochemistry of cell organelles, 3 op

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

743657S: Tumor cell biology, 3 op

Optional courses (vähintään 21 op)

In addition to compulsory and optional specialist courses (minimum 4 courses) student must select other courses listed in any MSc line, all together at least 108 credits. The remaining 12 credits can be either any other MSc courses or any other suitable courses according to student's career aspirations. Student is free to take courses from both lines and decide later according to subject of Pro Gradu work which MSc line to graduate in.

If You plan to take courses other than listed in any MSc line, please select "Optional courses at any university (0-12 ECTS)" option below (choose the degree structure page).

Optional courses (counted to 108 credits quota)

H325427: Optional courses - MSc, molecular and cellular biology, 9 - 40 op

Optional courses

- 744623S: Yeast genetics, 6 op
- 743661S: Virology, 3 op
- 743660S: Introduction to immunology, 3 op
- 743696S: Final examination in molecular and cellular biology, 9 op
- 744618S: Dissertation, 18 op
- 744625S: Scientific presentation, 1 - 2 op
- 300002M: Advanced Information Skills, 1 op
- 756625S: Genetic transformation of plants, 4 - 8 op
- 756627S: Plant hormones, 5 op
- 756618S: Secondary metabolism of plants, 4 op
- 747605S: Basic aspects of protein crystallographic methods, 3 op
- 747608S: Biochemical methodologies II, 8 op
- 747611S: Biochemistry of protein folding, 3 op
- 747606S: Structural enzymology, 3 op
- 747604S: Introduction to biocomputing, 3 op
- 784637S: Biological NMR Spectroscopy, 3 op
- 488304S: Bioreactor Technology, 6 op
- 488305S: Advanced Course for Biotechnology, 5 op
- 747609S: Introduction to membrane proteins I, 3 op
- 747610S: Introduction to membrane proteins II, 2,5 op

Optional courses at any university (0-12 ECTS)

746601S: Advanced studies in biochemistry in other universities, 0 - 75 op

746605S: Advanced studies in biochemistry passed abroad, 0 - 75 op

M.Sc. degree, Biochemistry (Protein Science and Biotechnology)

Tutkintorakenteen tila: published

Lukuvuosi: 2012-13

Lukuvuoden alkamispäivämäärä: 01.08.2012

Compulsory courses (77 - 85 op)

H325422: Compulsory courses - MSc, Protein science and biotechnology, 77 op

Compulsory courses

- 744620S: Protein chemistry II, 3 op
- 744621S: Molecular biology II, 3 op
- 747608S: Biochemical methodologies II, 8 op
- 902101Y: English for Biochemists 2, 3 op
- 747691S: Pro gradu experimental work in protein science and biotechnology, 28 op
- 747692S: Pro gradu thesis in protein science and biotechnology, 20 op

740672S: Maturity test (M.Sc. degree), 0 op

Orientation to research work: work done in an academic or industrial research group. Orientation to biochemical work: work done in a non research group environment. The sum of credits of both courses must be 12-20 ECTS.

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

744624S: Orientation to biochemical work, 0 - 20 op

Optional specialist courses (at least 4 must be taken) (11.5 - 21.5 op)

H325425: Optional specialist courses - MSc / Int MSc, Protein science and biotechnology, 11,5 - 21,5 op

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

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

747606S: Structural enzymology, 3 op

747611S: Biochemistry of protein folding, 3 op

744619S: Systems biology, 4 op

747603S: Bioinformatics, 2,5 op

784637S: Biological NMR Spectroscopy, 3 op

747604S: Introduction to biocomputing, 3 op

747609S: Introduction to membrane proteins I, 3 op

747610S: Introduction to membrane proteins II, 2,5 op

Optional courses (vähintään 13.5 op)

In addition to compulsory and optional specialist courses (minimum 4 courses) student must select other courses listed in any MSc line, all together at least 108 credits. The remaining 12 credits can be either any other MSc courses or any other suitable courses according to student's career aspirations. Student is free to take courses from both lines and decide later according to subject of Pro Gradu work which MSc line to graduate in.

If You plan to take courses other than listed in any MSc line, please select "Optional courses at any university (0-12 ECTS)" option below (choose the degree structure page).

Optional courses (counted to 108 credits quota)

H325428: Optional courses - MSc, Protein science and biotechnology, 1,5 - 31,5 op

Optional courses

744618S: Dissertation, 18 op

744625S: Scientific presentation, 1 - 2 op

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

300002M: Advanced Information Skills, 1 op

488304S: Bioreactor Technology, 6 op

488305S: Advanced Course for Biotechnology, 5 op

744623S: Yeast genetics, 6 op

743660S: Introduction to immunology, 3 op

743604S: Biochemistry of inherited diseases, 3 op

743655S: Neurobiology, 4 op

743659S: Biochemistry of cell organelles, 3 op

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

743657S: Tumor cell biology, 3 op

Optional courses at any university (0-12 ECTS)

746601S: Advanced studies in biochemistry in other universities, 0 - 75 op

746605S: Advanced studies in biochemistry passed abroad, 0 - 75 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

755318A: Animal physiology, exercises, 4 op
 751388A: Animal physiology, lectures, 4 op
 740365A: Biochemical Methodologies II, 8 op
 740148P: Biomolecules, 5 op
 740147P: Biomolecules for Bioscientists, 8 op
 755317A: Developmental biology-histology, exercises, 5 op
 751367A: Developmental biology-histology, lectures, 4 op
 902122Y: English for Biochemists 3, 3 op
 030005P: Information Skills, 1 op
 030008P: Information Skills for foreign degree students, 1 op
 780111P: Introduction to Analytical Chemistry, 4 op
 740379A: Introduction to immunology, 3 op
 780332A: Laboratory Course I in Organic Chemistry, 4 op
 740149P: Metabolism I, 4 op
 740374A: Microbiology, 3 op
 740373A: Molecular Biology I, 4 op
 780389A: Organic Chemistry I, 6 op
 748620J: Orientation to research work II, 18 - 40 op
 740371A: Physiological Biochemistry, 4 op
 746606S: Project work in Biochemistry, 1,5 op
 740368A: Radiation and Safety, 5 op
 740074Y: Tutoring/confidential posts, 1,5 op
 040900S: Using animals in research - carrying out procedures, 2,5 - 3 op
 040911S: Using animals in research - carrying out procedures, 3 op
 740380A: Virology, 3 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

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 can be exempted for some of the course.

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.

Language of instruction:

English

Timing:

1st year autumn and spring term

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 course you are expected to:

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

Mode of delivery:

-

Learning activities and teaching methods:

See Contents

Target group:

1st year Biochemistry students

Prerequisites and co-requisites:

-

Recommended optional programme components:

902101Y English for Biochemists 2

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 and the completion of homework tasks. A reading and/or oral exam will be organised if necessary.

Grading:

Pass/fail

Person responsible:

Jolene Gear

Working life cooperation:

none

Other information:

Registration will take place through WebOodi.

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

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

Proficiency level:

B1/B2/C1 (CEFR scale)

Status:

This course unit is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).

Required proficiency level:

The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or matriculation examination grade A - L or a passing grade from the Brush up course in Swedish 901018Y.

If a student doesn't meet these requirements or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course unit. Information about brushing up on one's language skills can be found in Finnish [here](#).

ECTS Credits:

2 ECTS credits (Biochemistry 3 ECTS credits)

Language of instruction:

Swedish

Timing:

See the study guide of the Faculty of Science.

Learning outcomes:

Upon completion of the course unit the student should have acquired the necessary proficiency level in Swedish to be able to manage in the most common communication situations related to his/her professional work tasks. He/she should be able to use basic grammatical structures fairly well in both speech and writing. He/she should be able to use the most common situational phrases understandably in various communication situations. He/she should be able to find the main points in general academic texts and texts related to his/her field of study and relay this information to colleagues or an audience of laymen using Swedish. He/she should be able to write short texts relating to his/her field of study.

Contents:

Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation. Situational oral exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Listening comprehension exercises. Written exercises relating to the student's professional field.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

2 ECTS credits: 28 hours of contact teaching (1 x 180 minutes per week) and related exercises, self-directed study. The course unit's total workload is 53 hours.

3 ECTS credits (biochemistry): 45 hours of contact teaching (2 x 90 minutes per week) and related exercises, 35 hours of self-directed study. The course unit's total workload is 80 hours.

Target group:

Students of the Faculty of Science

Prerequisites and co-requisites:

See Required Proficiency Level

Recommended optional programme components:

-

Recommended or required reading:

The material, which is special field-specific, authentic and up to date, is distributed during the course. Students must pay for their course material.

Assessment methods and criteria:

The course unit focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills. Students participate in the teaching in either autumn semester or spring semester.

Grading:

Assessment is based on continuous assessment and exams. Approved completion of the course unit requires that the student achieves at least satisfactory oral and written language skills. The grades are based on continuous assessment and the course exams. Oral and written language skills are graded separately. The possible grades are satisfactory skills (CERF proficiency level B1) and good skills (CERF proficiency levels B2-C1). For more information on the proficiency levels of oral and written language skills, see Assessment Criteria (in Finnish).

Person responsible:

Lecturer Rauno Varonen

Working life cooperation:

-

Other information:

Teaching will begin according to the schedule

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 successful completion students are able to:

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

Contents:

This module covers the basic methodologies used in practical biochemistry. The following topics will be addressed: safety in the laboratory, qualitative and quantitative observations, the calculations of concentrations and dilution factors (includes a workshop), pipette cleaning and calibration, identification and quantification of biological molecules, 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

18 h le, 2h exercises, 120 h lab

Target group:

Major students, Biology BSC-BS

Prerequisites and co-requisites:

Biomolecules, Biomolecules for Biochemists tai Biomolecules for Bioscientists

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Maija Ristel and Jari Heikkinen

Working life cooperation:

No

Other information:

-

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 are able to:

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

Contents:

This module provides an overview of biochemistry, outlining the forces involved in biomolecule structure and the chemical structures and properties of polynucleic acids, proteins, carbohydrates and lipids. There will also be an introduction to prebiotic evolution and a student debate on this subject. The module is arranged into lectures, workshops, a student debate and laboratory work. All of the exercises are in English. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, 48 h lab., plus exercises

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Continuous assessment, final examination

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

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

Contents:

On this course the central concepts and mechanisms of metabolism, its regulation and the integration of metabolic pathways will be introduced, like anabolism and catabolism, linking of different pathways, and metabolic regulation. Especially the energy metabolism will be studied, concerning carbohydrates, lipids and the respiratory chain. Combined with the course Metabolism II the students will get a good overview on the principles of metabolism, metabolic integration and the methods to study metabolism.

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

Target group:

Major subject students

Recommended optional programme components:

Biomolecules, Biomolecules for Biochemists tai Biomolecules for Bioscientists

Grading:

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

Person responsible:

Tuomo Glumoff

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. yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

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

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

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

Attendance of some parts of the course is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

36 h le and exercises

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Homeworks, workshops

Grading:

1-5/fail

Person responsible:

André Juffer

Working life cooperation:

No

Other information:

-

740150P: Transferable skills for biochemists, 2 op**Voimassaolo:** 01.08.2012 -**Opiskelumuoto:** Basic Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Tuomo Glumoff**Opintokohteen kielet:** Finnish**ECTS Credits:**

2 credits

Language of instruction:

Finnish

Timing:

B.Sc. yr1 spring

Learning outcomes:

Upon successful completion students are able to:

- process gel photographs taken in practicals and embed them into lab reports
- use Microsoft Word to write reports
- create standard curves using Microsoft Excel
- explain how to construct a good oral presentation
- list the basics of good scientific practice

Contents:

On overview is given of a commonly used word processor (Microsoft Word) and spreadsheet (Microsoft Excel). Students will be taught to use these software to create lab reports (word processing, gel photograph processing and embedding in lab reports). Other topics are the basics of oral presentation, ethics in scientific research and good scientific practice. Attendance of some parts is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures and computer practicals all together 14 hr, home exercises

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Continous assessment (computer practicals, home exercises)

Grading:

pass/fail

Person responsible:

Tuomo Glumoff

Working life cooperation:

No

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. yr2 autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures, 40 h lab

Target group:

Major students

Prerequisites and co-requisites:

Cell biology, Biomolecules for biochemists, Biochemical methodologies I

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Lab reports, final exam

Grading:

1-5/fail

Person responsible:

Sakari Kellokumpu

Working life cooperation:

No

Other information:

-

740366A: Cellular Communication, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

B.Sc. yr3 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures and student presentations, 40 h practicals

Target group:

Major students

Prerequisites and co-requisites:

Cellular biology

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Laboratory practicals, final exam

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

Other information:

-

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. A literature report will be written as well as a popularized presentation of it. 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

Language of instruction:

English

Timing:

B.Sc. yr3 spring

Learning outcomes:

Upon successful completion students are able to:

- present 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, Biochemical methodologies I, Physical biochemistry, Metabolism I, Molecular biology I, Cellular biology, Microbiology, Protein Chemistry I, Biochemical methodologies II, Cellular communication and Metabolism 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Student self-study

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final examination

Grading:

1-5/fail

Person responsible:

Conveners from the core modules coordinated by Lloyd Ruddock

Working life cooperation:

No

Other information:

-

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

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. yr2 autumn

Learning outcomes:

Students should be able to outline 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 completes the discussion of energy metabolism by combining it with metabolism of nitrogen-containing compounds and synthesis and degradation of different biomolecules, as well as extends the analysis of the central concepts and mechanisms of metabolism. 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. Special aspects of metabolism, like tissue specificity and physiological states, will also be studied. Photosynthesis is studied as continuation to energy metabolism.

Learning activities and teaching methods:

The module (6 credits) is arranged into lectures, workshops, homework and laboratory work (total ca. 70 h).

Target group:

Major subject students

Recommended optional programme components:

Metabolism I

Recommended or required reading:

Voet et al. Principles of Biochemistry (International Student Version), Wiley, ISBN-13 978-0470-23396-2

Grading:

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

Person responsible:

Tuomo Glumoff

740363A: Microbiology, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

ECTS Credits:

6 credits

Language of instruction:

English

Timing:

B.Sc. yr1 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 hours lecture and 60 hours laboratory exercises

Target group:

Major students

Prerequisites and co-requisites:

Biomolecules for Biochemists and Biochemical methodologies I

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Helmut Pospiech

Working life cooperation:

No

Other information:

-

740361A: Molecular Biology I, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Mirva Saaranen, Kaija Autio

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

Target group:

Major subject students

Recommended optional programme components:

Cellular biology, Biomolecules for Biochemists and Biochemical methodologies I

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 %

Person responsible:

Kaija Autio

740364A: Protein Chemistry I, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Martti Koski

Opintokohteen kielet: English

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

B.Sc. yr2 autumn

Learning outcomes:

Upon successful completion students are able to:

- tell the relevance of protein structure, including post-translational modification, to protein function
- describe the techniques available to purify proteins and to study protein function and have an appreciation of the applications and limitations of these techniques

- analyze a wide range of biochemical data and solve problems relating to the interpretation of data concerning protein function and basic structural characterization

Contents:

This module provides more detailed information on the chemistry of proteins. Topics covered include protein purification, reversible and irreversible covalent modifications of proteins, protein translocation, protein degradation, an introduction to the protein folding problem, protein structure analysis, basic enzyme catalysis mechanisms and co-enzymes. The module includes student presentations and the final examination. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, 80 h lab, exercises

Target group:

Major students

Prerequisites and co-requisites:

Biomolecules for Biochemists, Biokemian menetelmät I

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation, lab reports, final exam

Grading:

1-5/fail

Person responsible:

Kristian Koski

Working life cooperation:

Ei

780114P: General and Inorganic Chemistry I, 6 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Leena Kaila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay780117P	General and Inorganic Chemistry A (OPEN UNI)	5.0 op
ay780118P	General and Inorganic Chemistry B (OPEN UNI)	5.0 op
780109P	Basic Principles in Chemistry	4.0 op

ECTS Credits:

6 credits/160 hours of work

Language of instruction:

Finnish

Timing:

1 st Autumn

Learning outcomes:

After this course the student should understand 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.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

40 hours of lectures and applications, 24 hours of exercises and 96 hours of self-study

Target group:

Biochemistry, Chemistry, compulsory. Physical sciences, Mathematical sciences, optional.

Prerequisites and co-requisites:

Upper secondary school chemistry

Recommended optional programme components:

-

Recommended or required reading:

Petrucci, R.H., Herring, F.G., Madura, J.D. ja Bissonnette, C.: General Chemistry: Principles and Modern Applications, 10. painos (myös 7., 8. ja 9. painos), Pearson Canada Inc., Toronto, 2011. Chapters 1-11, 12.5-7, 13.2, 19.1-5.

Assessment methods and criteria:

Two intermediate examinations or one final examination

Grading:

1-5/fail

Person responsible:

Lecturer Leena Kaila

Working life cooperation:

No

Other information:

-

780115P: General and Inorganic Chemistry II, 6 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Leena Kaila

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay780117P General and Inorganic Chemistry A (OPEN UNI) 5.0 op

ay780118P General and Inorganic Chemistry B (OPEN UNI) 5.0 op

780109P Basic Principles in Chemistry 4.0 op

ECTS Credits:

6 credits/160 hours of work

Language of instruction:

Finnish

Timing:

1 st Autumn

Learning outcomes:

After this course the student should understand basic concepts of chemistry as described in international general chemistry curriculum.

Contents:

Intermolecular forces, phase equilibrium, reaction kinetics, chemical equilibrium, acid-base equilibrium, equilibrium in water solutions of slightly soluble salts, electrochemistry.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

40 hours of lectures and applications, 26 hours of exercises, 94 hours of self-study

Target group:

40 hours of lectures and applications, 26 hours of exercises, 94 hours of self-study

Prerequisites and co-requisites:

Upper secondary school chemistry

Recommended optional programme components:

-

Recommended or required reading:

Petrucci, R.H., Herring, F.G., Madura, J.D. ja Bissonnette, C.: General Chemistry: Principles and Modern Applications, 10. painos (myös 7., 8. ja 9. painos), Pearson Canada Inc., Toronto, 2011. Chapters 12.1-4, 13-18, 19.6-8,20.

Assessment methods and criteria:

Two intermediate examinations or one final examination

Grading:

1-5/fail

Person responsible:

Lecturer Leena Kaila

Working life cooperation:

No

Other information:

-

780103P: Introduction to Organic Chemistry, 6 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Johanna Kärkkäinen, Marja Lajunen

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

ECTS Credits:

6 credits/160 hours of work

Language of instruction:

Finnish. Book-examination in English as well.

Timing:

1st autumn and 1st spring

Learning outcomes:

After this course, the student can explain organic chemistry fundamentals, basic concepts and terminology, can use them for description of organic chemistry phenomena. He/she can name organic structures, explain their properties, deduce basic reaction types and solve their mechanisms.

Contents:

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

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

52 hours of lectures and applications plus 6 hours of exercises, 102 hours of independent self-study

Target group:

Biochemistry, Chemistry, compulsory.

Physical Sciences, Mathematical Sciences, optional.

Prerequisites and co-requisites:

Upper secondary school chemistry

Recommended optional programme components:

-

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.

Assessment methods and criteria:

Three intermediate examinations or one final examination

Grading:

1-5/fail

Person responsible:

Prof. Marja Lajunen and an other teacher

Working life cooperation:

No

Other information:

One of the intermediate examinations can be retaken.

780122P: Introductory Laboratory Course in Chemistry, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

3 credits/80 hours of work

Language of instruction:

Finnish

Timing:

1st autumn or spring

Learning outcomes:

After this course the student can apply laboratory safety instructions and act accordingly. He/she can communicate by using basic laboratory terminology and work in a group under the guidance. The student identifies basic laboratory tools and can use them properly. He/she can perform basic inorganic determinations: acid-base titrations, mass analysis or spectroscopic measurements and can apply them to analyze inorganic synthetic products, or use study thin layer chromatography to study purity of organic products. The student can write a report related to the performance and analysis of the synthesis.

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 an inorganic product, spectrophotometric determination, an organic synthesis, TLC. Written report.

Mode of delivery:

Supervised laboratory work

Learning activities and teaching methods:

Safety in laboratory 2 hours, 40 hours of laboratory work + demonstrations, 38 hours of self study

Target group:

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

Prerequisites and co-requisites:

Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended optional programme components:

The course Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or Biochemistry, Chemistry and teacher education students of Mathematics and Physics: simultaneous participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended or required reading:

Instruction Book (in Finnish): Kemian perustyöt

Assessment methods and criteria:

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

Grading:

Pass/fail

Person responsible:

Prof. Marja Lajunen and teaching assistants

Working life cooperation:

No

Other information:

Attendance at the lecture of Safety at work is compulsory. Deadline of the written report is binding. Failure will lead to the renewal of the work.

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 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

Ei opintojaksokuvauksia.

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 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.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

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

Target group:

Compulsory to the biology and biochemistry students.

Prerequisites and co-requisites:

Good basics in biology from elementary school.

Recommended optional programme components:

Cell biology is prerequisite for the following courses: Developmental biology-histology lectures and exercises (751367A, 755317A), Animal physiology lectures and exercises (751388A, 755318A), Functional plant biology lectures and exercises (752345A, 756341A), Concepts of genetics (753124P). Course also gives readiness for studies in molecular biology and biochemistry.

Recommended or required reading:

Oppikirja Alberts, B. ym. 2008: Molecular Biology of the Cell (5 th ed.). Garland Science Publishing, London, 1268 s. ISBN: 0815341067. (Lodish et al. 2004: Molecular Cell Biology (5 th 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/solubilsa/>.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Three exams.

Grading:

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

Person responsible:

Prof. Seppo Saarela, Prof. Hely Häggman and Dr. Helmi Kuittinen.

Working life cooperation:

No.

Other information:

-

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: Lumi Viljakainen, Savolainen Outi, Kuittinen, Helmi Helena, Päivi Leinonen

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.

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.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures, homework, the book.

Target group:

Compulsory to the biology students (7 cr.) Biochemistry students: parts 1 and 3 (4 cr.) compulsory, biophysics students.

Prerequisites and co-requisites:

Cell biology (750121P) or equivalent knowledge.

Recommended optional programme components:

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>

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Homeworks, participation, exams.

Grading:

1-5 / Fail.

Person responsible:

N.N.

Working life cooperation:

No.

Other information:

-

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

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

MSc 1st autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

During this module students will analyze their own protein samples 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, mass spectrometry, and proteomics based on 2D electrophoresis. For assessment each student has to write a research report in the style of a scientific publication. Attendance is compulsory

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Obligatory for M.Sc. in Protein Science and biotechnology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Report written in style of a scientific publication

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

Working life cooperation:

No

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**ECTS Credits:**

0 credits

Language of instruction:

Finnish / English

Timing:

M.Sc. yr2

Learning outcomes:

-

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.

Target group:

Majos students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written abstract of Pro Gradu thesis

Grading:

pass/fail

Working life cooperation:

NO

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

Language of instruction:

English

Timing:

M.Sc. yr1-yr2

Learning outcomes:

After the experimental work students is able to:

- undertake scientific research with supervision using typical methods in biochemistry
- plan and perform experiments in laboratory, perform efficient time management, consider his motivation and how to improve that, work independently and as part of a team
- identify and solve practical problems, 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 undertaken in the research groups of department of Biochemistry or in any other suitable research group in Finland or abroad.

Mode of delivery:

Face to face teaching

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Laboratory work of six months

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

Yes

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

Language of instruction:

English

Timing:

M.Sc. yr2

Learning outcomes:

On successful completion of this course, the student is able to:

- retrieve and appraise information critically and integrate information to new entity
- communicate in science and make and defend 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/>.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

-

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Assessment methods and criteria:

Written thesis

Grading:

1-5/fail

Working life cooperation:

No

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 are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Int MSc in Prot Sci

Prerequisites and co-requisites:

A BSc in biochemistry or a closely related subject.

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Continuous assessment (problem solving exercises, lab reports)

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

Other information:

.

744624S: Orientation to biochemical work, 0 - 20 op**Voimassaolo:** 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: English

Leikkaavuudet:

744629S Orientation to biochemical work 0.0 op

744617S Orientation to research work 0.0 op

Voidaan suorittaa useasti: Kyllä

Language of instruction:

English/Finnish

Timing:

M.Sc. yr1

Learning outcomes:

After this course student has gained experience of practical work done in non-research group environment. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

Contents:

This module provides an introduction to non-research work in companies or other suitable environment. The work can be either full-time or part-time work, with 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op can be awarded for working in one work placements. Each placement must be agreed in advance with the responsible person

Mode of delivery:

Face to face teaching

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

non-research work

Grading:

Pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

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. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

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 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op 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.

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Research work

Grading:

pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

H325421: Compulsory courses - MSc, molecular and cellular biology, 69 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Evangelia Kapetaniou

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

After the course, the students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h seminars, plus exercises and a student presentation

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Continuous assessment, presentation

Grading:

Pass/fail

Person responsible:

Evangelia Kapetaniou

Working life cooperation:

No

744621S: Molecular biology II, 3 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Elitsa Dimova, Daniela Mennerich**Opintokohteen kielet:** English**ECTS Credits:**

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

After the course students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h seminars, plus student presentations

Target group:

Major students

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written report, student presentation

Grading:

pass/fail

Person responsible:

Elitsa Dimova & Daniela Mennerich

Working life cooperation:

No

902101Y: English for Biochemists 2, 3 op

Voimassaolo: 01.08.2005 - 31.08.2016

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902101Y English for Biochemists 2 (OPEN UNI) 3.0 op

Proficiency level:

C1 on the CEFR scale

Status:

Compulsory for all 2nd year biochemistry students.

Required proficiency level:

Participants are expected to have studied English as an A1 or A2 language at school or to have acquired equivalent skills elsewhere.

ECTS Credits:

3 ECTS credits

Language of instruction:

English

Timing:

2nd year spring

Learning outcomes:

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

Learning outcomes:

By the end of the course, you are expected to be able to

1. write a research article that follows the main discourse conventions of biochemistry
2. prepare and deliver an oral scientific presentation supported by an effective slideshow
3. apply the rules of referencing
4. use a sufficient range of appropriate academic vocabulary relevant to your discipline
5. write with a good level of linguistic accuracy and correct punctuation
6. structure your work for optimal clarity and impact
7. make good use of feedback from peers and teachers to improve your own scientific production

Contents:

This course, which is linked to *Protein Chemistry 1*, will cover presentation skills (1 ECTS credit) and writing for scientific purposes (2 ECTS credits).

Mode of delivery:

-

Learning activities and teaching methods:

The course will comprise 26 classroom hours plus tutorials and independent work on presentation skills (for a presentation related to Protein Chemistry 1) and scientific writing (in conjunction with Protein Chemistry 1 and in preparation for the Biochemical Methods course later in the spring). Attendance at all classroom sessions is **compulsory**.

Target group:

2nd year biochemistry students

Prerequisites and co-requisites:

-

Recommended optional programme components:

902100Y English for Biochemists 1 must be completed

Recommended or required reading:

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

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 *Protein Chemistry 1* presentation and the final draft of a research article in protein chemistry.

Grading:

Pass/Fail

These final products will also be assessed by the teacher of the *Protein Chemistry 1* course and will contribute to the grade in that course.

Person responsible:

Heather Kannasmaa (presentation skills) and Suzy McAnsh (scientific writing)

Working life cooperation:

none

Other information:**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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

6 months project in a research group

Target group:

FM/Molekyyli- ja solubiologia

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

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

Language of instruction:

Finnish / English

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/>.

Target group:

M.Sc./ Molecular and cellular biology

Assessment methods and criteria:

Written thesis

Working life cooperation:

No

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

ECTS Credits:

0 credits

Language of instruction:

Finnish / English

Timing:

M.Sc. yr2

Learning outcomes:

-

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.

Target group:

Majos students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written abstract of Pro Gradu thesis

Grading:

pass/fail

Working life cooperation:

NO

Orientation to research work: work done in an academic or industrial research group. Orientation to biochemical work: work done in a non research group environment. The sum of credits of both courses must be 12-20 ECTS.

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. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

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 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op 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.

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Research work

Grading:

pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

744624S: Orientation to biochemical work, 0 - 20 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Practical training**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Jari Heikkinen**Opintokohteen kielet:** English**Leikkaavuudet:**

744629S Orientation to biochemical work 0.0 op

744617S Orientation to research work 0.0 op

Voidaan suorittaa useasti: Kyllä**Language of instruction:**

English/Finnish

Timing:

M.Sc. yr1

Learning outcomes:

After this course student has gained experience of practical work done in non-research group environment. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

Contents:

This module provides an introduction to non-research work in companies or other suitable environment. The work can be either full-time or part-time work, with 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op can be awarded for working in one work placements. Each placement must be agreed in advance with the responsible person

Mode of delivery:

Face to face teaching

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

non-research work

Grading:

Pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

H325424: Optional specialist courses - MSc, molecular and cellular biology, 11 - 22 op**Voimassaolo:** 01.08.2012 -**Opiskelumuoto:** Advanced Studies**Laji:** Study module**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

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

743604S: Biochemistry of inherited diseases, 3 op**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Heli Ruotsalainen**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.

Mode of delivery:

Face to face teaching

Target group:

M.Sc./Molecular and cellular biology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Thompson & Thompson, Genetics in Medicine,; Strachan, T., Read, A.P.: Human Molecular Genetics, Bios. Scientific Publishers Limited; Aula *et al.*, Perinnöllisyyslääketiede; the newist editions. Scientific articles.

Grading:

1-5/fail

Person responsible:

Heli Ruotsalainen

Working life cooperation:

No

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:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Major students

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

Working life cooperation:

No

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 are able to:

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

Contents:

The course will focus mainly on the cell biology and biochemistry of cellular differentiation and function in the mammalian nervous system. Lectures cover: Embryology and structure of the mammalian nervous system - Cells and the extracellular environment in nervous tissues - Neuronal structure and function - Glial cells of the CNS and PNS - Functional and structural relationships between neurons and glia - Myelin

synthesis, maintenance and function in the CNS and PNS - Cellular biochemistry of the transmission of the nervous impulse. The module includes an article analysis in small groups and presentation. Active participation and performance in article analysis exercises will contribute to the final mark.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

M.Sc./ Molecular and cellular biology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation, Essay

Grading:

1-5/fail

Person responsible:

Anthony Heape

Working life cooperation:

No

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 successful completion student are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

8 hr lectures, 30 h practicals

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Exam

Grading:

1-5/fail

Person responsible:

Ari-Pekka Kvist

Working life cooperation:

No

743659S: Biochemistry of cell organelles, 3 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Kalervo Hiltunen

Opintokohteen kielet: English

Leikkaavuudet:

743656S Biochemistry of cell organelles 2.5 op

ECTS Credits:

3 credits

Language of instruction:

Finnish/English

Timing:

M.Sc. yr1-yr2 autumn

Learning outcomes:

Upon successful completion students are able to:

- tell why is metabolism compartmentalized in eukaryotic cells?
- explain a role of cell organelles in metabolism
- describe and explain the 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

18 contact hours of lectures and seminars

Target group:

MSc / Molecular and cellular biology

Prerequisites and co-requisites:

Cellular biology or equivalent course

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Kalervo Hiltunen

Working life cooperation:

No

Other information:

-

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

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Pospiech, Helmut

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

MSc yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

The genetic information of all organisms is stored in the form of DNA. Since loss of DNA signifies loss of genetic information, DNA has to be maintained. This is in contrast to other biological macromolecules, which can be degraded and replaced by newly synthesised molecules. As a consequence, DNA has also

to be copied faithfully during the process of DNA replication that precedes every cell division. Damage inflicted continuously to the DNA has to be repaired. Eucaryotic DNA replication, DNA repair and DNA damage response are tightly coordinated in the context of the cell cycles and the nuclear metabolism.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 h lectures

Target group:

MSc in molecular and cellular biology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Lecture handouts and review articles

Assessment methods and criteria:

Presence at the lectures compulsory, preparatory questions and home work

Grading:

1-5/fail

Person responsible:

Helmut Pospiech

Working life cooperation:

No

743657S: Tumor cell biology, 3 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 h lectures and students presentations

Target group:

MSc / Molecular and cellular biology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

H325427: Optional courses - MSc, molecular and cellular biology, 9 - 40 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

*Optional courses***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:

Upon successful completion students are able to:

- tell a basic knowledge of yeast genetics and physiology
- tell the basic principles of using the yeast model organism to address fundamental genetic and cell biological problems
- (practical course) describe variety of genetic and molecular biology techniques commonly used to manipulate baker's yeast in the pursuit of biological questions

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Course review sessions, final exam, experiment reports

Grading:

1-5/fail

Person responsible:

Alexander Kastaniotis

Working life cooperation:

No

743661S: Virology, 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1-2 spring (starts 2015)

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures and student presentations in seminars

Target group:

MSc / Molecular and cellular biology

Prerequisites and co-requisites:

Cellular biology

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

Other information:

This module is the same as Virology (740380A)

743660S: Introduction to immunology, 3 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Tuomo Glumoff**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

740379A Introduction to immunology 3.0 op

740378A Basic immunobiology for biochemists 3.0 op

741661S	Immunobiology	3.0 op
740369A	Immunobiology	3.0 op

ECTS Credits:

3 credits

Language of instruction:

Partly Finnish, partly English

Timing:

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

Learning outcomes:

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

Contents:

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

Learning activities and teaching methods:

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

Recommended optional programme components:

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

Grading:

1-5/fail. Home exercise and final exam will count towards the final mark.

Person responsible:

Tuomo Glumoff

Other information:

This module is the same as 740379A Introduction to immunology

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

ECTS Credits:

9 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2

Learning outcomes:

Upon successful completion students (should) be able to:

- discuss the full breadth of the core topics of biochemistry, molecular and cellular biology
- Integrate material from multiple sources

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Student self-study

Target group:

M.Sc./Molecular and cellular biology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Oral examination

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

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 are able to:

- apply information in the right context, integrate information from a wide range of sources and evaluate it critically
- communicate science in extensive written format and discuss and defend scientific arguments
- demonstrate independent work 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 for these two modules will look better on their CV.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

480 hours of student work

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written report

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

744625S: Scientific presentation, 1 - 2 op

Voimassaolo: 01.03.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: Finnish

ECTS Credits:

1-2 credits

Language of instruction:

Finnish and English

Timing:

M.Sc.

Learning outcomes:

The student makes a presentation and participates in an international scientific conference with their own presentation. The presentation may be a poster, a talk or equivalent. The student uses the skills learned in the B.Sc. or otherwise in planning and realizing the presentation. The student practices communication skills necessary for research work.

Contents:

Student participates in a conference and delivers a poster, a talk or equivalent. The contents of which must include student's own results, for example from the Master's Thesis work. The pro gradu supervisor or other suitable person supervises the planning and realization of the presentation.

Learning activities and teaching methods:

A poster, a talk or equivalent is delivered. The workload of the course may vary depending on the extent and the form of presentation.

Prerequisites and co-requisites:

No compulsory preceding courses

Recommended or required reading:

-

Assessment methods and criteria:

Study diary, a copy of presentation or poster

Grading:

pass/fail

Person responsible:

Amanuensis

Working life cooperation:

No

Other information:

The amount of credits is estimated based on the workload of the planning and realization of the presentation, but not the length of the meeting.

30002M: 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

ECTS Credits:

1 credit

Language of instruction:

Finnish

Timing:

Recommend to degree students who are working on their diploma/master's thesis. The course unit is held once in the autumn and once in the spring semester.

Learning outcomes:

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

Contents:

Scientific information retrieval, evaluation of search results and information sources, information search on subject areas of diploma/master's thesis.

Mode of delivery:

Blended teaching: lectures, web-based learning material and exercises in Optima environment, personal guidance

Learning activities and teaching methods:

Lectures 6-12h, self-study 20h, personal guidance 1h

Target group:

The course is optional for students of the Faculty of Science and the Faculty of Technology.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Parts from the following chapters of the Toolbox of Research: <https://wiki oulu.fi/display/jotut/1.1+Tieteellinen+tiedonhankinta>, <https://wiki oulu.fi/display/jotut/1.3.1+Tieteellisiin+julkaisuihin+pohjautuva+arviointi>

Assessment methods and criteria:

Passing the course requires participation in the lectures (6h) and personal guidance and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

756625S: Genetic transformation of plants, 4 - 8 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

Leikkaavuudet:

756652S Genetic transformation of plants 5.0 op

ECTS Credits:

4 cr.

Language of instruction:

Finnish / English.

Timing:

M.Sc. 1st or 2nd autumn, every second year.

Learning outcomes:

The student will assess and apply the concept of genetical modification. The student will apply the different techniques of genetic transformation and will judge their pros and cons.

Contents:

The lectures will cover gene constructs, marker-genes, different genetic transformation methods, legislation, and commercial cultivations. The exercises will familiarize the students with the most common genetic transformation methods including Agrobacterium-mediated transformation, electroporation, biolistic transformation and VIGS.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lab course + demonstrations (45 h) and lectures (20 h), reports, lecture exam and final conclusions.

Target group:

BS students.

Prerequisites and co-requisites:

Lectures of Advanced course in plant biology (752682S) helps in following the course.

Recommended optional programme components:

-

Recommended or required reading:

Handout and supplementary reading.

Assessment methods and criteria:

Report, seminar and exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Hely Häggman.

Working life cooperation:

No.

Other information:

-

756627S: Plant hormones, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Häggman, Hely Margaretha

Opintokohteen kielet: Finnish

ECTS Credits:

4 cr.

Language of instruction:

Finnish / English.

Timing:

M.Sc. 1st or 2nd spring, every second year.

Learning outcomes:

The students will assess the plant hormone action, understand hormone interactions and the significance of the hormone balance as well as the molecular mechanisms.

Contents:

Plant hormones are signalling molecules with profound effects on growth and development at trace quantities. Until quite recently plant development was considered to be regulated by auxins, gibberellins, cytokinins, ethylene and abscisic acid. New analytical and molecular methods have evidenced new plant hormone receptors and signalling pathways. During the lectures the mode of action of the hormones and the latest literature is used to gain the most recent view of the topic.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

20 h and exam.

Target group:

Suitable for BSb and ecophysicologists.

Prerequisites and co-requisites:

Basics of functional plant biology lectures and exercises (752345A, 756341A).

Recommended optional programme components:

-

Recommended or required reading:

Chapters concerning plant hormones from Taiz, L. & Zeiger, E. 2010: Plant Physiology. Sinauer Associates Inc. 5. ed. and literature given in the lectures.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Anja Hohtola and prof. Hely Häggman.

Working life cooperation:

No.

Other information:

-

756618S: Secondary metabolism of plants, 4 op

Voimassaolo: - 31.07.2014

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Hohtola, Anja Terttu Marjatta

Opintokohteen kielet: Finnish

ECTS Credits:

4 cr.

Language of instruction:

Finnish / English.

Timing:

M.Sc. 1st or 2nd spring, odd years.

Learning outcomes:

The students will be able to define the role of plant secondary metabolism/metabolites, and the biosynthetic pathways involved. The possible role of secondary metabolites will be touched upon.

Contents:

General introduction to phenolic compounds, terpenoids, sterols, alkaloids; their synthesis and meaning for the plant. The economic importance and potential of plant secondary metabolites as fine chemicals and important traits of plants concerning quality and resistance will be discussed. The technological and economic feasibility of the large-scale culture of plant cells for the production of secondary metabolites are touched. Isolation and processing of useful metabolites will be discussed.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (18 h) and seminars (4 h), literature, final exam.

Target group:

-

Prerequisites and co-requisites:

No.

Recommended optional programme components:

-

Recommended or required reading:

Literature agreed on lectures.

Assessment methods and criteria:

Exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Anja Hohtola .

Working life cooperation:

No.

Other information:

-

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 autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures and seminars

Target group:

M.Sc. in Protein Science and biotechnology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Oral presentation

Grading:

pass/fail

Person responsible:

Rik Wierenga

Working life cooperation:

No

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

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

MSc 1st autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

During this module students will analyze their own protein samples 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, mass spectrometry, and proteomics based on 2D electrophoresis. For assessment each student has to write a research report in the style of a scientific publication. Attendance is compulsory

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Obligatory for M.Sc. in Protein Science and biotechnology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Report written in style of a scientific publication

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

Working life cooperation:

No

747611S: Biochemistry of protein folding, 3 op

Voimassaolo: 01.06.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Leikkaavuudet:

747602S Biochemistry of protein folding 2.5 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc., yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 contact hours of lectures and seminars

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

Protein chemistry I or Protein production and analysis or equivalent

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

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:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures and seminars

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Oral presentation

Grading:

pass/fail

Person responsible:

Rikkert Wierenga

Working life cooperation:

No

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:

Upon successful completion students are able to:

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

Contents:

An overview is given of commonly employed techniques of biocomputing to study the structural, dynamical, functional and thermodynamical properties of proteins and membranes and their interaction with other molecules. This will include a overview of computer simulation techniques such as molecular dynamics, Monte Carlo and Langevin (stochastic, Brownian) dynamics, but also concepts of continuum electrostatics,

statistical thermodynamics, protein modeling techniques, protein-ligand affinity calculations and the computer simulation of the protein folding process and enzyme action. In addition, some topics in the field of Bioinformatics are discussed as well and certain commonly employed protein modeling software is introduced.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures, student tasks

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation, group discussion

Grading:

pass/fail

Person responsible:

Andre Juffer

Working life cooperation:

No

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 kielet: English

ECTS Credits:

3 credits/80 hours of work

Language of instruction:

English

Timing:

The course is lectured every year.

Learning outcomes:

After the course the students have basic knowledge and hands on experience with backbone assignment of small ^{15}N / ^{13}C labelled protein using most common 3 dimensional 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.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

14 hours of lectures + applications, 30 hours of exercises, 36 hours of self-study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Zerbe (ed): Bio-NMR in Drug Research, Wiley-VCH and Cavanagh: Protein NMR Spectroscopy, Academic Press, 1995 (partly) ISBN: 0121644901.

Assessment methods and criteria:

Final examination

Grading:

1-5/fail

Person responsible:

Senior assistant, docent Sampo Mattila

Working life cooperation:

No

Other information:

-

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

Opintokohteen kielet: English

Leikkaavuudet:

488321S Bioreactor technology 5.0 op

480431S Bioprocesses II 5.0 op

ECTS Credits:

6 cr

Language of instruction:

English

Timing:

In period 1

Learning outcomes:

Objective: The course provides the student with more profound understanding of bioreactor technology. It specifically focuses on the structures of bioreactors and their performance and operation and on the kinetics related to microbial growth and product formation, scale related items, function of enzymes and transfer phenomena.

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 sterilization. The student will be able to apply different mathematical formulas for biocatalysis and for the bioreactor performance and use those to plan and analyze bioprocesses. The student will also be able to produce, analyze and interpret data from bioprocesses.

Contents:

Biotechnological process: General process schemes, batch, fed batch and continuous processes, biocatalysts and raw materials. Reactor design and instrumentation. Sterilization: kinetics of heat inactivation and practical implementation of sterilization methods. Mathematical description and quantification of the function of biocatalysts. Monod and Michaelis-Menten models, reaction rates and their determination. The lag phase of growth, cellular maintenance, cell death. Kinetics of product and by-product formation. Kinetics of oxygen and heat transfer. Oxygen and heat balances: significance and calculations. Power consumption. Scale-up and scale-down.

Mode of delivery:

Lectures, exercises and homework.

Learning activities and teaching methods:

Lectures 36 h / exercises 6 h / homework 50 h / self-study 68 h.

Target group:

Master students of bioprocess engineering and environmental engineering students in M.Sc. Programme in Green Chemistry and Bioproduction. Master students from process engineering and biochemistry with required prerequisites.

Prerequisites and co-requisites:

The bachelor level courses by the Environmental Engineering (especially 488301A Microbiology, 488302A Basics of biotechnology) or respective knowledge.

Recommended optional programme components:

Recommended or required reading:

Lectures: Lecture hand outs; Doran, P. M. . Bioprocess engineering principles. Academic Press. London, 2010 . Supplementary material: Enfors, S.-O., Häggström, L. . Bioprocess technology fundamentals and applications. Royal Institute of Technology. Stockholm 2011. ; Biotechnology (Vol 2): Fundamentals of biochemical engineering. . Toim. H.-J. Rehm and G. Reed, Weinheim, Wiley-VCH. 1991. Villadsen J., Nielsen J., Liden G. Bioreactor engineering principles. Springer Verlag, 2011.

Assessment methods and criteria:

Lectures, exercises, final exam, homework. Grade will be composed of final exam, exercises and homework.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Heikki Ojamo

Working life cooperation:

No

488305S: Advanced Course for Biotechnology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumoto: 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

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

In periods 2-3

Learning outcomes:

Objective: This course aims to give the student a more advanced and updated perspective on major biotechnological applications and other current topics in the field.

Learning outcomes: After completing this course, the student will be able to describe the most important techniques - both up- and downstream - in protein and metabolite production. Further, the student will be able to present main features of the biotechnology based on renewable raw materials.

Contents:

Microbial homologous and heterologous protein production. Physiological and process related items in the production of selected microbial metabolites. Principles and practices in metabolic engineering. Methods for process intensification. Unit operations in product recovery and purification. Specific features of biorefineries.

Mode of delivery:

Lectures, exercises and homework.

Learning activities and teaching methods:

Lectures 30 h / exercises 6 h / homework 44 h / self-study 50 h.

Target group:

Master students of bioprocess engineering and environmental engineering students in M.Sc. Programme in Green Chemistry and Bioproduction. Master students from process engineering and biochemistry with required prerequisites.

Prerequisites and co-requisites:

The preceding courses by the Bioprocess Engineering Laboratory (especially 488301A Microbiology, 488302A Basics of biotechnology and 488304S Bioreactor Technology) or respective knowledge.

Recommended optional programme components:**Recommended or required reading:**

Will be announced at the lectures.

Assessment methods and criteria:

Lectures and final examination, exercises and the report. Grade will be composed of homework exercises, final examinations and report.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Heikki Ojamo

Working life cooperation:

No

747609S: Introduction to membrane proteins I, 3 op

Voimassaolo: 01.05.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Veli-Pekka Jaakola

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 spring

Learning outcomes:

Upon completion the students (should) be able to:

- describe the difference between soluble, membrane associate and integral membrane proteins (MPs), be able to describe the importance of MPs in health and disease, and be able to describe important structural and sequence features of membrane proteins.
- identify the various classes of MPs, and be able to describe the differences between them.
- discuss the structure and composition of the biological membranes: lipid bilayer and the three types of lipids contained (their general functions and properties), the properties of liposomes, membrane carbohydrates (oligosaccharides) and the conditions influencing membrane fluidity.
- use the Protein Data Bank to retrieve coordinate files of proteins whose 3D structures are known and to be familiar with various MP structure resources.
- describe specific techniques used to study MPs in lipid bilayers, detergent micelles and reconstituted vesicles.
- understand the structure and composition of the biological membranes: lipid bilayer and the three types of lipids contained (their general functions and properties), the properties of liposomes, membrane carbohydrates (oligosaccharides) and the conditions influencing membrane fluidity.
- use the Protein Data Bank to retrieve coordinate files of proteins whose 3D structures are known and to be familiar with various MP structure resources.
- describe specific techniques used to study MPs in lipid bilayers, detergent micelles and reconstituted vesicles

Contents:

In the part one of this course, we will discuss the basic principles that govern the function-structure relationship of membrane proteins (MPs). Students will be introduced to the different classes of MPs using examples that play important roles in human health and disease. Concepts of MP function and structure will be introduced. Full description and course website: <http://www.biochem oulu.fi/tutkimus/vjaakola/membraneproteins.html>

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h lectures, 4-6 homework problems or quantitative aspect and final exam

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Homeworks, final exam

Grading:

1-5/fail

Person responsible:

Veli-Pekka Jaakola

Working life cooperation:

No

747610S: Introduction to membrane proteins II, 2,5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Veli-Pekka Jaakola

Opintokohteen kielet: English

ECTS Credits:

2.5 credits

Language of instruction:

English

Timing:

M.Sc. yr2 autumn or spring

Learning outcomes:

Upon successful completion students are able to:

- present a short review of a current research status in membrane protein biochemistry and biophysics
- describe various MPs of known structure and explain their basic mechanisms (such as G protein coupled receptors, Na-K ATPase, Co-transporters, Complex I-IV, Porins and Connexins).
- describe conceptually and mathematically some of the basic energy, signal and material transfers across membrane bilayer (such as membrane polarity, action potential and electron transport
- use graphical software (such as pymol and VMD) to visualize and manipulate MP and membrane bilayer 3D structures.

Contents:

In the part two of membrane protein course, working in study groups students are required to study a MP of known structure in details, analyze and understand the details of the structure carefully, and summarize their findings in a short project paper. Groups will prepare a short presentation (20 min presentation and 10 min discussion) about their assignment system. All students will be responsible for reading the papers, give feed-back during discussions and grade the papers.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

lectures, group work, student presentations and discussions

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

Introduction to membrane proteins I; Structural enzymology or equal recommended

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation

Grading:

1-5/fail

Person responsible:

Veli-Pekka Jaakola

Working life cooperation:

No

746601S: Advanced studies in biochemistry in other universities, 0 - 75 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

746605S: Advanced studies in biochemistry passed abroad, 0 - 75 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

H325422: Compulsory courses - MSc, Protein science and biotechnology, 77 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory courses

744620S: Protein chemistry II, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Evangelia Kapetaniou

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

After the course, the students are able to:

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

- present and explain work related to protein purification and analysis

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h seminars, plus exercises and a student presentation

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Continuous assessment, presentation

Grading:

Pass/fail

Person responsible:

Evangelia Kapetaniou

Working life cooperation:

No

744621S: Molecular biology II, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Elitsa Dimova, Daniela Mennerich

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 autumn

Learning outcomes:

After the course students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h seminars, plus student presentations

Target group:

Major students

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written report, student presentation

Grading:

pass/fail

Person responsible:

Elitsa Dimova & Daniela Mennerich

Working life cooperation:

No

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

ECTS Credits:

8 credits

Language of instruction:

English

Timing:

MSc 1st autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

During this module students will analyze their own protein samples 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, mass spectrometry, and proteomics based on 2D electrophoresis. For assessment each student has to write a research report in the style of a scientific publication. Attendance is compulsory

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Obligatory for M.Sc. in Protein Science and biotechnology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Report written in style of a scientific publication

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

Working life cooperation:

No

902101Y: English for Biochemists 2, 3 op

Voimassaolo: 01.08.2005 - 31.08.2016

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902101Y English for Biochemists 2 (OPEN UNI) 3.0 op

Proficiency level:

C1 on the CEFR scale

Status:

Compulsory for all 2nd year biochemistry students.

Required proficiency level:

Participants are expected to have studied English as an A1 or A2 language at school or to have acquired equivalent skills elsewhere.

ECTS Credits:

3 ECTS credits

Language of instruction:

English

Timing:

2nd year spring

Learning outcomes:

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

Learning outcomes:

By the end of the course, you are expected to be able to

1. write a research article that follows the main discourse conventions of biochemistry
2. prepare and deliver an oral scientific presentation supported by an effective slideshow
3. apply the rules of referencing
4. use a sufficient range of appropriate academic vocabulary relevant to your discipline
5. write with a good level of linguistic accuracy and correct punctuation
6. structure your work for optimal clarity and impact
7. make good use of feedback from peers and teachers to improve your own scientific production

Contents:

This course, which is linked to *Protein Chemistry 1*, will cover presentation skills (1 ECTS credit) and writing for scientific purposes (2 ECTS credits).

Mode of delivery:

-

Learning activities and teaching methods:

The course will comprise 26 classroom hours plus tutorials and independent work on presentation skills (for a presentation related to Protein Chemistry 1) and scientific writing (in conjunction with Protein Chemistry 1 and in preparation for the Biochemical Methods course later in the spring). Attendance at all classroom sessions is **compulsory**.

Target group:

2nd year biochemistry students

Prerequisites and co-requisites:

-

Recommended optional programme components:

902100Y English for Biochemists 1 must be completed

Recommended or required reading:

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

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 *Protein Chemistry 1* presentation and the final draft of a research article in protein chemistry.

Grading:

Pass/Fail

These final products will also be assessed by the teacher of the *Protein Chemistry 1* course and will contribute to the grade in that course.

Person responsible:

Heather Kannasmaa (presentation skills) and Suzy McAnsh (scientific writing)

Working life cooperation:

none

Other information:**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

Language of instruction:

English

Timing:

M.Sc. yr1-yr2

Learning outcomes:

After the experimental work students is able to:

- undertake scientific research with supervision using typical methods in biochemistry
- plan and perform experiments in laboratory, perform efficient time management, consider his motivation and how to improve that, work independently and as part of a team
- identify and solve practical problems, 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 undertaken in the research groups of department of Biochemistry or in any other suitable research group in Finland or abroad.

Mode of delivery:

Face to face teaching

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Laboratory work of six months

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

Yes

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

Language of instruction:

English

Timing:

M.Sc. yr2

Learning outcomes:

On successful completion of this course, the student is able to:

- retrieve and appraise information critically and integrate information to new entity
- communicate in science and make and defend 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/>.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

-

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Assessment methods and criteria:

Written thesis

Grading:

1-5/fail

Working life cooperation:

No

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

ECTS Credits:

0 credits

Language of instruction:

Finnish / English

Timing:

M.Sc. yr2

Learning outcomes:

-

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.

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written abstract of Pro Gradu thesis

Grading:

pass/fail

Working life cooperation:

NO

Orientation to research work: work done in an academic or industrial research group. Orientation to biochemical work: work done in a non research group environment. The sum of credits of both courses must be 12-20 ECTS.

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. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

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 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op 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.

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Research work

Grading:

pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

744624S: Orientation to biochemical work, 0 - 20 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Practical training**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Jari Heikkinen**Opintokohteen kielet:** English**Leikkaavuudet:**

744629S Orientation to biochemical work 0.0 op

744617S Orientation to research work 0.0 op

Voidaan suorittaa useasti: Kyllä**Language of instruction:**

English/Finnish

Timing:

M.Sc. yr1

Learning outcomes:

After this course student has gained experience of practical work done in non-research group environment. Student is able to:

- demonstrate goal-oriented teamwork
- apply methods used in proper environment
- discuss the practical work done and reflect his knowledge

Contents:

This module provides an introduction to non-research work in companies or other suitable environment. The work can be either full-time or part-time work, with 1.5op being awarded for each full-time week equivalent worked. A maximum of 6op can be awarded for working in one work placements. Each placement must be agreed in advance with the responsible person

Mode of delivery:

Face to face teaching

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

non-research work

Grading:

Pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

Other information:

The sum of credits from courses 744624S and 744617S must be 12-20 credits (for Int MSc in protein science line 12-18 credits)

H325425: Optional specialist courses - MSc / Int MSc, Protein science and biotechnology, 11,5 - 21,5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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

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 autumn

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures and seminars

Target group:

M.Sc. in Protein Science and biotechnology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Oral presentation

Grading:

pass/fail

Person responsible:

Rik Wierenga

Working life cooperation:

No

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:

Upon successful completion students are able to:

- discuss the methods that are used to crystallize proteins
- describe the basic concepts of the transition state theory
- define the relation between reaction rates and free energy barriers

- describe enzyme reaction mechanisms
- describe the concepts of catalytic bases and acids
- illustrate active site strain
- tell the importance of active site electrostatics
- describe the concept of transition state analogues

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures and seminars

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Oral presentation

Grading:

pass/fail

Person responsible:

Rikkert Wierenga

Working life cooperation:

No

747611S: Biochemistry of protein folding, 3 op

Voimassaolo: 01.06.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Leikkaavuudet:

747602S Biochemistry of protein folding 2.5 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc., yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 contact hours of lectures and seminars

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

Protein chemistry I or Protein production and analysis or equivalent

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

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:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Major students

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

1-5/fail

Person responsible:

Tuomo Glumoff

Working life cooperation:

No

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 successful completion student are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

8 hr lectures, 30 h practicals

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Exam

Grading:

1-5/fail

Person responsible:

Ari-Pekka Kvist

Working life cooperation:

No

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 kielet: English

ECTS Credits:

3 credits/80 hours of work

Language of instruction:

English

Timing:

The course is lectured every year.

Learning outcomes:

After the course the students have basic knowledge and hands on experience with backbone assignment of small ^{15}N / ^{13}C labelled protein using most common 3 dimensional 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.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

14 hours of lectures + applications, 30 hours of exercises, 36 hours of self-study

Target group:

Chemistry, optional

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Zerbe (ed): Bio-NMR in Drug Research, Wiley-VCH and Cavanagh: Protein NMR Spectroscopy, Academic Press, 1995 (partly) ISBN: 0121644901.

Assessment methods and criteria:

Final examination

Grading:

1-5/fail

Person responsible:

Senior assistant, docent Sampo Mattila

Working life cooperation:

No

Other information:

-

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:

Upon successful completion students are able to:

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

Contents:

An overview is given of commonly employed techniques of biocomputing to study the structural, dynamical, functional and thermodynamical properties of proteins and membranes and their interaction with other molecules. This will include a overview of computer simulation techniques such as molecular dynamics, Monte Carlo and Langevin (stochastic, Brownian) dynamics, but also concepts of continuum electrostatics,

statistical thermodynamics, protein modeling techniques, protein-ligand affinity calculations and the computer simulation of the protein folding process and enzyme action. In addition, some topics in the field of Bioinformatics are discussed as well and certain commonly employed protein modeling software is introduced.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

20 h lectures, student tasks

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation, group discussion

Grading:

pass/fail

Person responsible:

Andre Juffer

Working life cooperation:

No

747609S: Introduction to membrane proteins I, 3 op

Voimassaolo: 01.05.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Veli-Pekka Jaakola

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1 spring

Learning outcomes:

Upon completion the students (should) be able to:

- describe the difference between soluble, membrane associate and integral membrane proteins (MPs), be able to describe the importance of MPs in health and disease, and be able to describe important structural and sequence features of membrane proteins.
- identify the various classes of MPs, and be able to describe the differences between them.
- discuss the structure and composition of the biological membranes: lipid bilayer and the three types of lipids contained (their general functions and properties), the properties of liposomes, membrane carbohydrates (oligosaccharides) and the conditions influencing membrane fluidity.
- use the Protein Data Bank to retrieve coordinate files of proteins whose 3D structures are known and to be familiar with various MP structure resources.

- describe specific techniques used to study MPs in lipid bilayers, detergent micelles and reconstituted vesicles.
- understand the structure and composition of the biological membranes: lipid bilayer and the three types of lipids contained (their general functions and properties), the properties of liposomes, membrane carbohydrates (oligosaccharides) and the conditions influencing membrane fluidity.
- use the Protein Data Bank to retrieve coordinate files of proteins whose 3D structures are known and to be familiar with various MP structure resources.
- describe specific techniques used to study MPs in lipid bilayers, detergent micelles and reconstituted vesicles

Contents:

In the part one of this course, we will discuss the basic principles that govern the function-structure relationship of membrane proteins (MPs). Students will be introduced to the different classes of MPs using examples that play important roles in human health and disease. Concepts of MP function and structure will be introduced. Full description and course website: <http://www.biochem oulu.fi/tutkimus/vjaakola/membraneproteins.html>

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

12 h lectures, 4-6 homework problems or quantitative aspect and final exam

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Homeworks, final exam

Grading:

1-5/fail

Person responsible:

Veli-Pekka Jaakola

Working life cooperation:

No

747610S: Introduction to membrane proteins II, 2,5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Veli-Pekka Jaakola

Opintokohteen kielet: English

ECTS Credits:

2.5 credits

Language of instruction:

English

Timing:

M.Sc. yr2 autumn or spring

Learning outcomes:

Upon successful completion students are able to:

- present a short review of a current research status in membrane protein biochemistry and biophysics
- describe various MPs of known structure and explain their basic mechanisms (such as G protein coupled receptors, Na-K ATPase, Co-transporters, Complex I-IV, Porins and Connexins).
- describe conceptually and mathematically some of the basic energy, signal and material transfers across membrane bilayer (such as membrane polarity, action potential and electron transport)
- use graphical software (such as pymol and VMD) to visualize and manipulate MP and membrane bilayer 3D structures.

Contents:

In the part two of membrane protein course, working in study groups students are required to study a MP of known structure in details, analyze and understand the details of the structure carefully, and summarize their findings in a short project paper. Groups will prepare a short presentation (20 min presentation and 10 min discussion) about their assignment system. All students will be responsible for reading the papers, give feed-back during discussions and grade the papers.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

lectures, group work, student presentations and discussions

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

Introduction to membrane proteins I; Structural enzymology or equal recommended

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation

Grading:

1-5/fail

Person responsible:

Veli-Pekka Jaakola

Working life cooperation:

No

H325428: Optional courses - MSc, Protein science and biotechnology, 1,5 - 31,5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Study module

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

*Optionall courses***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 are able to:

- apply information in the right context, integrate information from a wide range of sources and evaluate it critically
- communicate science in extensive written format and discuss and defend scientific arguments
- demonstrate independent work 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 for these two modules will look better on their CV.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

480 hours of student work

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Written report

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

744625S: Scientific presentation, 1 - 2 op

Voimassaolo: 01.03.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Heikkinen

Opintokohteen kielet: Finnish

ECTS Credits:

1-2 credits

Language of instruction:

Finnish and English

Timing:

M.Sc.

Learning outcomes:

The student makes a presentation and participates in an international scientific conference with their own presentation. The presentation may be a poster, a talk or equivalent. The student uses the skills learned in the B.Sc. or otherwise in planning and realizing the presentation. The student practices communication skills necessary for research work.

Contents:

Student participates in a conference and delivers a poster, a talk or equivalent. The contents of which must include student's own results, for example from the Master's Thesis work. The pro gradu supervisor or other suitable person supervises the planning and realization of the presentation.

Learning activities and teaching methods:

A poster, a talk or equivalent is delivered. The workload of the course may vary depending on the extent and the form of presentation.

Prerequisites and co-requisites:

No compulsory preceding courses

Recommended or required reading:

-

Assessment methods and criteria:

Study diary, a copy of presentation or poster

Grading:

pass/fail

Person responsible:

Amanuensis

Working life cooperation:

No

Other information:

The amount of credits is estimated based on the workload of the planning and realization of the presentation, but not the length of the meeting.

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:

- discuss 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Student self-study

Target group:

M.Sc. in Protein science and biotechnology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Oral examination

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

30002M: 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**ECTS Credits:**

1 credit

Language of instruction:

Finnish

Timing:

Recommend to degree students who are working on their diploma/master's thesis. The course unit is held once in the autumn and once in the spring semester.

Learning outcomes:

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

Contents:

Scientific information retrieval, evaluation of search results and information sources, information search on subject areas of diploma/master's thesis.

Mode of delivery:

Blended teaching: lectures, web-based learning material and exercises in Optima environment, personal guidance

Learning activities and teaching methods:

Lectures 6-12h, self-study 20h, personal guidance 1h

Target group:

The course is optional for students of the Faculty of Science and the Faculty of Technology.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Parts from the following chapters of the Toolbox of Research: <https://wiki oulu.fi/display/jotut/1.1+Tieteellinen+tiedonhankinta>, <https://wiki oulu.fi/display/jotut/1.3.1+Tieteellisiin+julkaisuihin+pohjautuva+arviointi>

Assessment methods and criteria:

Passing the course requires participation in the lectures (6h) and personal guidance and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

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

Opintokohteen kielet: English

Leikkaavuudet:

488321S Bioreactor technology 5.0 op

480431S Bioprocesses II 5.0 op

ECTS Credits:

6 cr

Language of instruction:

English

Timing:

In period 1

Learning outcomes:

Objective: The course provides the student with more profound understanding of bioreactor technology. It specifically focuses on the structures of bioreactors and their performance and operation and on the kinetics related to microbial growth and product formation, scale related items, function of enzymes and transfer phenomena.

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 sterilization. The student will be able to apply different mathematical formulas for biocatalysis and for the bioreactor performance and use those to plan and analyze bioprocesses. The student will also be able to produce, analyze and interpret data from bioprocesses.

Contents:

Biotechnological process: General process schemes, batch, fed batch and continuous processes, biocatalysts and raw materials. Reactor design and instrumentation. Sterilization: kinetics of heat inactivation and practical implementation of sterilization methods. Mathematical description and quantification of the function of biocatalysts. Monod and Michaelis-Menten models, reaction rates and their determination. The lag phase of growth, cellular maintenance, cell death. Kinetics of product and by-product formation. Kinetics of oxygen and heat transfer. Oxygen and heat balances: significance and calculations. Power consumption. Scale-up and scale-down.

Mode of delivery:

Lectures, exercises and homework.

Learning activities and teaching methods:

Lectures 36 h / exercises 6 h / homework 50 h / self-study 68 h.

Target group:

Master students of bioprocess engineering and environmental engineering students in M.Sc. Programme in Green Chemistry and Bioproduction. Master students from process engineering and biochemistry with required prerequisites.

Prerequisites and co-requisites:

The bachelor level courses by the Environmental Engineering (especially 488301A Microbiology, 488302A Basics of biotechnology) or respective knowledge.

Recommended optional programme components:

Recommended or required reading:

Lectures: Lecture hand outs; Doran, P. M. . Bioprocess engineering principles. Academic Press. London, 2010 . Supplementary material: Enfors, S.-O., Häggström, L. . Bioprocess technology fundamentals and applications. Royal Institute of Technology. Stockholm 2011. ; Biotechnology (Vol 2): Fundamentals of biochemical engineering. . Toim. H.-J. Rehm and G. Reed, Weinheim, Wiley-VCH. 1991. Villadsen J., Nielsen J., Liden G. Bioreactor engineering principles. Springer Verlag, 2011.

Assessment methods and criteria:

Lectures, exercises, final exam, homework. Grade will be composed of final exam, exercises and homework.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Heikki Ojamo

Working life cooperation:

No

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

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

In periods 2-3

Learning outcomes:

Objective: This course aims to give the student a more advanced and updated perspective on major biotechnological applications and other current topics in the field.

Learning outcomes: After completing this course, the student will be able to describe the most important techniques - both up- and downstream - in protein and metabolite production. Further, the student will be able to present main features of the biotechnology based on renewable raw materials.

Contents:

Microbial homologous and heterologous protein production. Physiological and process related items in the production of selected microbial metabolites. Principles and practices in metabolic engineering. Methods for process intensification. Unit operations in product recovery and purification. Specific features of biorefineries.

Mode of delivery:

Lectures, exercises and homework.

Learning activities and teaching methods:

Lectures 30 h / exercises 6 h / homework 44 h / self-study 50 h.

Target group:

Master students of bioprocess engineering and environmental engineering students in M.Sc. Programme in Green Chemistry and Bioproduction. Master students from process engineering and biochemistry with required prerequisites.

Prerequisites and co-requisites:

The preceding courses by the Bioprocess Engineering Laboratory (especially 488301A Microbiology, 488302A Basics of biotechnology and 488304S Bioreactor Technology) or respective knowledge.

Recommended optional programme components:

Recommended or required reading:

Will be announced at the lectures.

Assessment methods and criteria:

Lectures and final examination, exercises and the report. Grade will be composed of homework exercises, final examinations and report.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Heikki Ojamo

Working life cooperation:

No

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:

Upon successful completion students are able to:

- tell a basic knowledge of yeast genetics and physiology
- tell the basic principles of using the yeast model organism to address fundamental genetic and cell biological problems
- (practical course) describe variety of genetic and molecular biology techniques commonly used to manipulate baker's yeast in the pursuit of biological questions

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

Major students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Course review sessions, final exam, experiment reports

Grading:

1-5/fail

Person responsible:

Alexander Kastaniotis

Working life cooperation:

No

743660S: Introduction to immunology, 3 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Tuomo Glumoff**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

740379A Introduction to immunology 3.0 op

740378A Basic immunobiology for biochemists 3.0 op

741661S Immunobiology 3.0 op

740369A Immunobiology 3.0 op

ECTS Credits:

3 credits

Language of instruction:

Partly Finnish, partly English

Timing:

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

Learning outcomes:

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

Contents:

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

Learning activities and teaching methods:

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

Recommended optional programme components:

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

Grading:

1-5/fail. Home exercise and final exam will count towards the final mark.

Person responsible:

Tuomo Glumoff

Other information:

This module is the same as 740379A Introduction to immunology

743604S: Biochemistry of inherited diseases, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Heli Ruotsalainen

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.

Mode of delivery:

Face to face teaching

Target group:

M.Sc./Molecular and cellular biology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Thompson & Thompson, Genetics in Medicine,; Strachan, T., Read, A.P.: Human Molecular Genetics, Bios. Scientific Publishers Limited; Aula *et al.*, Perinnöllisyyslääketiede; the newest editions. Scientific articles.

Grading:

1-5/fail

Person responsible:

Heli Ruotsalainen

Working life cooperation:

No

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 are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

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

Target group:

M.Sc./ Molecular and cellular biology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Presentation, Essay

Grading:

1-5/fail

Person responsible:

Anthony Heape

Working life cooperation:

No

743659S: Biochemistry of cell organelles, 3 op**Voimassaolo:** 01.08.2010 -**Opiskeluoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Kalervo Hiltunen

Opintokohteen kielet: English

Leikkaavuudet:

743656S Biochemistry of cell organelles 2.5 op

ECTS Credits:

3 credits

Language of instruction:

Finnish/English

Timing:

M.Sc. yr1-yr2 autumn

Learning outcomes:

Upon successful completion students are able to:

- tell why is metabolism compartmentalized in eukaryotic cells?
- explain a role of cell organelles in metabolism
- describe and explain the 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.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

18 contact hours of lectures and seminars

Target group:

MSc / Molecular and cellular biology

Prerequisites and co-requisites:

Cellular biology or equivalent course

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Kalervo Hiltunen

Working life cooperation:

No

Other information:

-

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

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Pospiech, Helmut

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

MSc yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 h lectures

Target group:

MSc in molecular and cellular biology

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Lecture handouts and review articles

Assessment methods and criteria:

Presence at the lectures compulsory, preparatory questions and home work

Grading:

1-5/fail

Person responsible:

Helmut Pospiech

Working life cooperation:

No

743657S: Tumor cell biology, 3 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

M.Sc. yr1-yr2 spring

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

16 h lectures and students presentations

Target group:

MSc / Molecular and cellular biology

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

746601S: Advanced studies in biochemistry in other universities, 0 - 75 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

746605S: Advanced studies in biochemistry passed abroad, 0 - 75 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Lloyd Ruddock

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

755318A: Animal physiology, exercises, 4 op

Voimassaolo: 01.08.2011 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen kielet: Finnish

Leikkaavuudet:

755327A Animal physiology exercises 5.0 op

ECTS Credits:

4 cr.

Language of instruction:

Finnish.

Timing:

B.Sc. 3rd autumn.

Learning outcomes:

Students know basic physiological methods and can design simple experiments.

Contents:

The laboratory course will familiarize students with the use of simple experimental trials, laboratory tests and computer aided measurements the physiological basic principles.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

32 h laboratory training, exam.

Target group:

BS compulsory, TEAbs optional.

Prerequisites and co-requisites:

Cell biology (750121P) and Animal physiology, lectures (751388A).

Recommended optional programme components:

This course is a prerequisite for the courses Comparative animal physiology (751x84A/S), and Advanced animal physiology (751635S).

Recommended or required reading:

Animal physiology course booklet.

Assessment methods and criteria:

Exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Seppo Saarela.

Working life cooperation:

No.

Other information:

-

751388A: Animal physiology, lectures, 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 kielet: Finnish

Leikkaavuudet:

755323A Animal physiology 5.0 op

ECTS Credits:

4 cr.

Language of instruction:

Finnish.

Timing:

B.Sc. 2nd spring.

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.

Contents:

Course focus on the basic problematic of physiological themes including nervous system, muscles, circulation, nutrition, metabolism, immune system, hormones and reproduction physiology.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

50 h lectures and independent studying, mid-semester exams, home essays.

Target group:

Compulsory to the biology students.

Prerequisites and co-requisites:

Cell biology (750121P) or equivalent knowledge.

Recommended optional programme components:

This course is a prerequisite for the courses Animal physiology, exercises (755318A), Comparative animal physiology (751x84A/S) and Advanced course in animal physiology (751635S).

Recommended or required reading:

Reece, J.B. Urry, L.A. Cain, M.L., Wasserman, S.A. Minorsky, P.V. & Jackson R.B. 2011: Campbell Biology (9. painos). Pearson, Global Edition, 1309 s, handouts.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

Home essays and exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Seppo Saarela.

Working life cooperation:

No.

Other information:

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

Recommended optional programme components:

Biomolecules for Biochemists and Biochemical methodologies I

Grading:

1-5/fail

Person responsible:

Ulrich Bergmann

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 are able to:

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

Contents:

This module provides an overview of biochemistry, outlining the forces involved in biomolecule structure and the chemical structures and properties of polynucleic acids, proteins, carbohydrates and lipids. There will also be an introduction to prebiotic evolution and a student debate on this subject. The module is arranged into lectures, workshops, a student debate. All of the exercises are in English. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, plus exercises

Target group:

Minor subject students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Continuous assessment, final examination

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

Other information:

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

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 are able to:

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

Contents:

This module provides an overview of biochemistry, outlining the forces involved in biomolecule structure and the chemical structures and properties of polynucleic acids, proteins, carbohydrates and lipids. There will also be an introduction to prebiotic evolution and a student debate on this subject. The module is arranged into lectures, workshops, a student debate and laboratory work. All of the exercises are in English. Both a final examination and continuous assessment will count towards the final mark and attendance of some parts is compulsory.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

30 h lectures, 48 h lab., plus exercises

Target group:

Minor subject students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Continuous assessment, final examination

Grading:

1-5/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

No

Other information:

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

755317A: Developmental biology-histology, exercises, 5 op

Voimassaolo: 01.08.2011 - 31.07.2019

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biology

Arvostelu: 1 - 5, pass, fail

Opettajat: Saarela, Seppo Yrjö Olavi

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr.

Language of instruction:

Finnish.

Timing:

B. Sc. 1st 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.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

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

Target group:

BS: compulsory, TEAbs optional.

Prerequisites and co-requisites:

Cell biology (750121P) or equivalent knowledge.

Recommended optional programme components:

Same time with Developmental biology-histology lectures (751367A).

Recommended or required reading:

Handout.

Assessment methods and criteria:

Exercise exam.

Grading:

1-5 / Fail.

Person responsible:

Prof. Seppo Saarela.

Working life cooperation:

No.

Other information:

-

751367A: Developmental biology-histology, lectures, 4 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: 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:

4 cr.

Language of instruction:

Finnish.

Timing:

B.Sc. 1 st 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.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

38 h lectures and two exams.

Target group:

Compulsory to biology students.

Prerequisites and co-requisites:

Cell biology (750121P) or equivalent knowledge.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes, lecture handouts. Recommended reading: Sariola, Frilander ym., Solusta yksilöksi: Kehitysbiologia, Duodecim, Helsinki 2003; Gilbert: Developmental Biology, Sinauer Press, 6.ed. 2000, or newer; Young & Heath: Wheater's Functional Histology, Churchill Livingstone, 4. ed. 2000, or newer.

The availability of the literature can be checked from [this link](#).

Assessment methods and criteria:

2 lecture exams.

Grading:

1-5 / Fail.

Person responsible:

Prof. Esa Hohtola.

Working life cooperation:

No.

Other information:

-

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

Required proficiency level:

-

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 course, students are expected to be able to

1.
 1. write a research article that follows the main discourse conventions of biochemistry
 2. prepare and deliver an oral scientific presentation supported by an effective slideshow
 3. apply the rules of referencing
 4. use a sufficient range of appropriate academic vocabulary relevant to their discipline
 5. report their work orally or in writing with accuracy and in an appropriate academic style
 6. structure their work for optimal clarity and impact
 7. make good use of feedback from peers and teachers to improve their own scientific production

Contents:

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

Mode of delivery:

Contact teaching

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

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

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)

Working life cooperation:

none

Other information:

-

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

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

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P Introduction to Information Retrieval 0.0 op

ECTS Credits:

1 ECTS credit

Language of instruction:

Finnish

Timing:

2nd or 3rd year

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.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student's own choice

Learning activities and teaching methods:

Training sessions 8h, group working 7h, self-study 12h

Target group:

Compulsory for all students of the Faculty of Technology. In the Faculty of Science the course is compulsory for students of biology, physics, geosciences, chemistry, geography and information processing science. The course is optional for students of biochemistry and mathematics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material <https://wiki oulu.fi/display/030005P>.

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, tellustiето (at) oulu.fi

Working life cooperation:

-

Other information:

-

030008P: Information Skills for foreign degree students, 1 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

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

Opintokohteen kielet: English

ECTS Credits:

1 ECTS credit

Language of instruction:

English

Timing:

The course is held in the spring semester

Learning outcomes:

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

Contents:

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

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student's own choice

Learning activities and teaching methods:

Training sessions 8h, self-study 19h

Target group:

The course is intended to degree students of the Faculty of Science and the Faculty of Technology.

Prerequisites and co-requisites:

It is recommended that the student knows the basic services of Oulu University Library. The student can participate in the Library ABC –training (<http://www oulu.fi/library/node/10710>).

Recommended optional programme components:

-

Recommended or required reading:

Parts from the following chapters of the Toolbox of Research: <https://wiki oulu.fi/display/tor/1.1+Finding+scientific+information>

[1.3.1+Evaluation+based+on+academic+publishing](https://wiki oulu.fi/display/tor/1.3.1+Evaluation+based+on+academic+publishing)

<https://wiki oulu.fi/display/tor/1.3.1+Evaluation+based+on+academic+publishing>

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

Working life cooperation:

-

Other information:

-

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 kielet: Finnish

Leikkaavuudet:

780110P Analytical Chemistry I 5.5 op

ECTS Credits:

4 credits /105 hours of work

Language of instruction:

Finnish

Timing:

2nd autumn

Learning outcomes:

Upon completion the student should have acquired knowledge and understanding of 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.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

30 hours of lectures + 10 hours of exercises + 65 hours of self-study

Target group:

Biochemistry, Chemistry, compulsory.

Mathematical Sciences, Physical Sciences, optional.

Prerequisites and co-requisites:

General and Inorganic Chemistry I and II (780114P and 780115P) or Introduction to Chemistry (780113P) or Basic Principles in Chemistry (780109P).

Recommended optional programme components:

-

Recommended or required reading:

Saarinen, H. ja Lajunen, L.H.J.: Analyttisen kemian perusteet, Oulun yliopistopaino, 2004.

Assessment methods and criteria:

Two intermediate examinations or one final examination

Grading:

1-5/fail

Person responsible:

Prof. Paavo Perämäki

Working life cooperation:

No

Other information:

-

740379A: Introduction to immunology, 3 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomo Glumoff

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

ECTS Credits:

3 credits

Language of instruction:

Partly Finnish, partly English

Timing:

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

Learning outcomes:

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

Contents:

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

Learning activities and teaching methods:

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

Target group:

Major and minor subject undergraduates

Recommended optional programme components:

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

Grading:

1-5/fail. Home exercise and final exam will count towards the final mark.

Person responsible:

Tuomo Glumoff

Other information:

This module is the same as 743660S Introduction to immunology

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: Juha Heiskanen

Opintokohteen kielet: Finnish

ECTS Credits:

4 credits/107 hours of work

Language of instruction:

Finnish, English on demand, materials in English (partly)

Timing:

2nd autumn

Learning outcomes:

Upon completion of the course, the student is familiar with safety issues, glassware and equipment, use of laboratory notebook and written reporting of laboratory experiments. He/she should be able to work by using basic techniques of organic chemistry such as distillation, extraction, crystallization, TLC. The student familiarizes with practical laboratory work by carrying out aromatic substitution with protective group strategy, an organometallic reaction, 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.

Mode of delivery:

Face-toface teaching in the laboratory

Learning activities and teaching methods:

50 hours of supervised laboratory, independent laboratory work and 57 hours of self-study and reporting

Target group:

Biochemistry, compulsory

Prerequisites and co-requisites:

General and Inorganic Chemistry I and General and Inorganic Chemistry II (780114P and 780115P) or Introduction to Chemistry (780113P) or Introduction to Physical Chemistry (780101P) and Introduction to Inorganic Chemistry (780102P) or Basic Principles in Chemistry (780109P), Introduction to Organic Chemistry (780103P), and Introductory Laboratory Course (780122P) passed.

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Works, reports and the final exam passed.

Grading:

1-5/fail

Person responsible:

Juha Heiskanen

Working life cooperation:

No

Other information:

Reports must be returned to the teaching assistants by the given deadline. Otherwise you have to do the work again.

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

Contents:

On this course the central concepts and mechanisms of metabolism, its regulation and the integration of metabolic pathways will be introduced, like anabolism and catabolism, linking of different pathways, and metabolic regulation. Especially the energy metabolism will be studied, concerning carbohydrates, lipids and the respiratory chain. Combined with the course Metabolism II the students will get a good overview on the principles of metabolism, metabolic integration and the methods to study metabolism.

Learning activities and teaching methods:

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

Target group:

Minor subject students

Recommended optional programme components:

Biomolecules for Biochemists or Biomolecules for Bioscientists or Biomolecules

Grading:

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

Person responsible:

Tuomo Glumoff

Other information:

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

740374A: Microbiology, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

740363A Microbiology 6.0 op

740322A Microbiology 3.0 op

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

spring

Learning outcomes:

Learning outcomes: Upon successful completion students are able to:

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

Contents:

This module is an introduction to general and applied microbiology and consists of lecture and laboratory exercises. In the lectures, the diversity and classification of micro organisms, especially bacteria will be

introduced. Further topics are the structure and function of the prokaryotic cell, bacterial growth, metabolism and physiology, the importance of bacteria in different ecosystems as well as the industrial use of bacteria.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lecture

Target group:

Minor subject students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Continuous assessment (home works), final exam

Grading:

1-5/fail

Person responsible:

Helmut Pospiech

Working life cooperation:

No

Other information:

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

740373A: Molecular Biology I, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Kaija Autio, Mirva Saaranen

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 optional programme components:

Cellular biology, Biomolecules for Biochemists, Biochemical methodologies I

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 %

Person responsible:

Kaija Autio

Other information:

This course is the same as Molecular biology I (740361A) but without practical part

780389A: Organic Chemistry I, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Chemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Hormi Osmo

Opintokohteen kielet: Finnish

Leikkaavuudet:

780385A Organic Chemistry I 9.0 op

ECTS Credits:

6 credits/160 hours of work

Language of instruction:

Finnish

Timing:

2nd autumn

Learning outcomes:

After passing the course the student can explain the basics in molecular orbitals in simple organic compounds such as ethane, basics in physical organic chemistry especially the Hammett plot, details in nucleophilic substitution, conformation and stereochemistry in organic compounds.

Contents:

Molecular orbitals in organic compounds, conformation theory, Hammett plot, nucleophilic substitution and stereochemistry.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

50 hours of lectures, 110 hours self study

Target group:

Chemistry, compulsory

Prerequisites and co-requisites:

Introduction to Organic Chemistry (780103P) and Introduction to Chemistry (780113P) or Introduction to Physical Chemistry (780101P).

Recommended optional programme components:

-

Recommended or required reading:

Clayden, J., Greeves, N., Warren, S. and Wothers, P.: Organic Chemistry, Oxford University Press, 2001. Chapters 1-4, 7, 16-18, 34 ja 42 and pages 1090-1100.

Assessment methods and criteria:

Two intermediate examinations or one final examination

Grading:

1-5/fail

Person responsible:

Prof. Osmo Hormi

Working life cooperation:

No

Other information:

-

748620J: Orientation to research work II, 18 - 40 op

Voimassaolo: 01.11.2011 -

Opiskelumuoto: Post-graduate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Language of instruction:

English

Timing:

PhD yr1

Learning outcomes:

Upon successful completion students are able to discuss and apply methods involved in research at the PhD level.

Contents:

This module provides an introduction to research work at the PhD level via the active integration of students into research groups and the provision of training in relevant methodologies and evaluation techniques. 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. 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. As part of this module students are expected to do an oral presentation to the department and prepare a written report on their work, demonstrating understanding of the methodologies used and their appropriateness as well as critical evaluation of the results obtained.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Research work

Assessment methods and criteria:

Oral presentation and a written report

Grading:

pass/fail

Person responsible:

Jari Heikkinen

Working life cooperation:

Yes

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:

- Understand the tasks of different organs in metabolism
- Understand the basics of regulation of metabolism

- 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

Prerequisites and co-requisites:

Metabolism I and Molecular biology I

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Kalervo Hiltunen

Working life cooperation:

No

Other information:

Recommended optional course

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

ECTS Credits:

1,5 credits

Language of instruction:

English

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

Research work done in the 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.

Mode of delivery:

Face to face teaching

Target group:

This module is meant for exchange students only

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Research work in the lab

Grading:

pass/fail

Person responsible:

Lloyd Ruddock

Working life cooperation:

Yes

740368A: Radiation and Safety, 5 op**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Department of Biochemistry**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Sakari Kellokumpu**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 optional programme components:

Biochemical methodologies I, Metabolism I and Molecular biology I

Recommended or required reading:

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

Grading:

1-5/fail

Person responsible:

Sakari Kellokumpu

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 Working group on development of teaching (OKTR) or as a member of working committee of OKTR .

Learning activities and teaching methods:

10-20 h tutoring of a small group, autumn yr2-yr3, activity in Working group on development of teaching (OKTR) or in working committee of OKTR. Optional.

Grading:

pass/fail

Person responsible:

Amanuensis

040900S: Using animals in research - carrying out procedures, 2,5 - 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Laboratory Animal Centre

Arvostelu: 1 - 5, pass, fail

Opettajat: Voipio Hanna-marja

Opintokohteen kielet: Finnish

Leikkaavuudet:

040911S Using animals in research - carrying out procedures 3.0 op

Ei opintojaksokuvauksia.

040911S: Using animals in research - carrying out procedures, 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Laboratory Animal Centre

Arvostelu: 1 - 5, pass, fail

Opettajat: Voipio Hanna-marja

Opintokohteen kielet: Finnish

Leikkaavuudet:

040900S Using animals in research - carrying out procedures 2.5 op

Ei opintojaksokuvauksia.

740380A: Virology, 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Biochemistry

Arvostelu: 1 - 5, pass, fail

Opettajat: Thomas Kietzmann

Opintokohteen kielet: English

ECTS Credits:

3 credits

Language of instruction:

English

Timing:

BSc. yr3 spring (starts 2015)

Learning outcomes:

Upon successful completion students are able to:

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

Contents:

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

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

24 h lectures and student presentations in seminars

Target group:

Major students

Prerequisites and co-requisites:

Cellular biology

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Final exam

Grading:

1-5/fail

Person responsible:

Thomas Kietzmann

Working life cooperation:

No

Other information:

This module is the same as Virology (743661S)