



Studieplan 2012/2013

One-year Add-on Programme in Biotechnology

Studiepoeng: 60

Studiets varighet, omfang og nivå

Length and academic level

The programme is a 60 ECTS credits study programme with a full-time workload over one academic year at mid-/upper Bachelor`s level.

Innledning

Introduction

In the years to come, biotechnology will play an increasingly, important role in how society develops. Biotechnology entails the utilisation of microorganisms, animal and/or plant cells to create useful and necessary products. Biotechnology provides the means for the genetic modification of living organisms and their function.

Genetic engineering can, for instance, help in the development of new and improved vaccines. Biotechnology can be used as a tool to elucidate basic biological processes, but may also be used in diagnostics, for hygienic control, for the purification of water, raw materials, finished products, for bioproduction processes and for dealing with waste products and pollution.

Enterprises and companies in a rapidly growing biotechnological industry experience an increasing demand for qualified workers. The study programme prepares students for work in the biotechnological and pharmaceutical industries, the food processing industry, and in public and private research and development laboratories.

Læringsutbytte

Educational goals

En kandidat med fullført kvalifikasjon skal ha følgende totale læringsutbytte:

The study programme will help students acquire knowledge and skills in biotechnological subjects, based on an understanding of basic chemistry and biology. The students are expected to exhibit a breadth of understanding in major subjects such as biochemistry, microbiology, genetics, molecular biology, bioprocess technology and industrial biotechnology. During the study programme, the students are to have attained the motivation, theoretical knowledge and practical skills making them well equipped for a career in biotechnology-based activities and for further education in biotechnology.

Målgruppe



Target group

The study programme targets people who already have a foundation in chemistry and biology, and wish to acquire theoretical knowledge and practical skills in biotechnology.

Kompetanse

Qualification attained

The study programme prepares students for work in the biotechnological and pharmaceutical industries, the food processing industry, and in public and private research and development laboratories. When combined with, or included in a Bachelor's Degree, the one-year study programme will also provide qualifications necessary for admission to the Master's Degree Programme in Applied and Commercial Biotechnology at Hedmark University College, and related master's degree programmes at other universities and university colleges.

Opptakskrav fritekst

Admission requirements: In addition to standard higher education admittance requirements, the applicant must have successfully completed course exams comprising at least 60 ECTS credits in mathematics and natural sciences, including a foundation in chemistry and biology.

Undervisnings- og læringsformer

Teaching and learning methods

The instruction is based on lectures, workshops/group work, laboratory exercises and excursions. Use of the University College's e-learning system, Fronter, will constitute an intergrated part of the instruction.

Vurderingsformer

Assessment methods

There are varied assessment methods, both regarding intermittent assessment and final assessment. These are: Written examination, oral examination, laboratory reports, project reports, hand-in assignments and portfolios. A letter grading scale is used. Grades are awarded according to a graded scale from A (highest) to F (lowest), with E as the minimum pass grade.

Internasjonalisering

Internationalisation

Exchange students from our collaborating academic institutions abroad, may, partially or completely, include the one-year study programme in their Bachelor's Degree at their home institution.

All lectures, instructions and teaching material in the one-year study programme are in English language.



Studiets innhold, oppbygging og organisering

Content and organization

The programme comprises 60 ECTS course credits, or 40/45 course credits and a senior thesis project of 15/20 credits. Students select courses based on their background and own interests.

The senior thesis project is reserved for students who already have course exams in subjects found in the list of courses, or similar to our courses.

Four of the courses are taught in the autumn semester, and three in the spring semester. Senior thesis project can be taken over one or two semesters.

The courses are described in greater detail below.



The following courses can be selected

Emner

Studiepoeng År 1

- [Senior Thesis Project - Biotechnology](#) (optional)
20 studiepoeng S2(V)
- [Senior Thesis Project - Biotechnology](#) (optional)
15 studiepoeng S1(H)
- [Industrial Biotechnology](#) (optional)
5 studiepoeng S2(V)
- [Biochemistry and Molecular Biology lab](#) (optional)
10 studiepoeng S2(V)
- [Microbiology](#) (optional)
10 studiepoeng S2(V)
- [Bioprocess technology](#) (optional)
15 studiepoeng S1(H)
- [Biochemistry](#) (optional)
10 studiepoeng S1(H)
- [Molecular Biology](#) (optional)
10 studiepoeng S1(H)
- [Genetics](#) (optional)
10 studiepoeng S1(H)



Emneoversikt

2BT231 Senior Thesis Project - Biotechnology

Emnekode: 2BT231

Studiepoeng: 20

Språk

English

Forkunnskaper

Prerequisites: Recommended prerequisites: 2KJ231 Biochemistry or similar, and 2BI251 Molecular Biology or similar.

Læringsutbytte

Objectives:

Students work independently, and/or in groups, on a subject of considerable dimension, and synthesise the results in a thesis that satisfies criteria for reporting scientific findings.

Innhold

Course content:

During the thesis work, students accomplish an experimental investigation or a literature review. The project culminates in a written thesis. The question in focus will be determined by the student in concert with the advisor, and must be relevant to the program of study.

Organisering og arbeidsformer

Organisation and teaching methods:

Students plan and execute the investigation under supervision. The thesis work is normally carried out individually, or in groups of two students.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements: None

Vurderingsordning

Assessment:



Written thesis

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BT221 Senior Thesis Project - Biotechnology

Emnekode: 2BT221

Studiepoeng: 15

Språk

English

Forkunnskaper

Prerequisites: Recommended prerequisites: 2KJ231 Biochemistry or similar, and 2BI251 Molecular Biology or similar.

Læringsutbytte

Objectives:

Students work independently, and/or in groups, on a subject of considerable dimension, and synthesise the results in a thesis that satisfies criteria for reporting scientific findings.

Innhold

Course content:

During the thesis work, students accomplish an experimental investigation or a literature review. The project culminates in a written thesis. The question in focus will be determined by the student in concert with the advisor, and must be relevant to the program of study.

Organisering og arbeidsformer

Organisation and teaching methods:

Students plan and execute the investigation under supervision. The thesis work is normally carried out individually, or in groups of two students.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements:

None

Vurderingsordning

Assessment:

Written thesis



Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BT211 Industrial Biotechnology

Emnekode: 2BT211

Studiepoeng: 5

Språk

English

Forkunnskaper

Prerequisites: None

Læringsutbytte

Objectives:

The student shall have acquired an overview of important products and processes employed in modern biotechnology industry, and be able to describe what identifies the various product sectors. To provide an overview and be able to discuss details of significant processes and products in biotechnological industries and commercial biology based activities.

Innhold

Course content:

Topics (may vary from year to year): Industrial production systems based on microorganisms and cell cultures. Bioethanol, organic acids, antibiotics, industrial enzymes, recombinant proteins, monoclonal antibodies. Vaccine production. Enzyme technology.

Organisering og arbeidsformer

Organisation and teaching methods:

Lectures.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements:

None.

Vurderingsordning

Assessment:



Written 4-hour examination.

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BI261 Biochemistry and Molecular Biology lab

Emnekode: 2BI261

Studiepoeng: 10

Språk

English

Forkunnskaper

Prerequisites: Recommended prerequisites: 2KJ231 Biochemistry or similar, and 2BI251 Molecular Biology or similar.

Læringsutbytte

Objectives:

Students shall learn laboratory methods central to the fields of biochemistry and molecular biology. Students shall understand the uses of, and principles that underlie, each method, and be able to work independently with the techniques and instrumentation employed in the course.

Innhold

Course contents:

Biochemistry: Quantitative measurement, spectrophotometry, isolation and characterisation of DNA and proteins, ion exchange chromatography, SDS-PAGE, enzyme kinetics, carbohydrate chemistry.

Molecular Biology: Polymerase chain reaction (PCR), gel electrophoresis, cloning into plasmid vectors, preparation & transformation of competent *E. coli*, plasmid DNA isolation, restriction analysis, DNA cycle sequencing & capillary electrophoresis, bioinformatics.

Course contents:

Biochemistry: Quantitative measurement, spectrophotometry, isolation and characterisation of DNA and proteins, ion exchange chromatography, SDS-PAGE, enzyme kinetics, carbohydrate chemistry.

Molecular Biology: Polymerase chain reaction (PCR), gel electrophoresis, cloning into plasmid vectors, preparation & transformation of competent *E. coli*, plasmid DNA isolation, restriction analysis, DNA cycle sequencing & capillary electrophoresis, bioinformatics.

Organisering og arbeidsformer

Organisation and teaching methods:

Group work in the laboratory, submission of laboratory reports of completed exercises, student



presentations, and independent study groups.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements (for eligibility to take the examination) :

Approved laboratory reports from all the exercises for which a report is required. Volume of laboratory course will be given at the beginning of the semester.

Vurderingsordning

Assessment:

Portfolio that counts 60 % (includes two reports from the Biochemistry section, selected by the instructor and one comprehensive report from Molecular Biology section), and a written 4-hour, final examination that counts 40 %.

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BI231 Microbiology

Emnekode: 2BI231

Studiepoeng: 10

Språk

English

Forkunnskaper

Prerequisites: None

Læringsutbytte

Objectives:

The students shall have an overview over fundamental concepts and principles in the field of microbiology. This will include microbial diversity, ecology, evolution, systematic and laboratory techniques used to study microorganisms.

Innhold

Course content:

Microbial cell structure, function, growth, growth control, evolution, systematic and laboratory techniques.

Organisering og arbeidsformer

Organisation and teaching methods:

Lectures and laboratory course.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements (for eligibility to take the examination) :

Approved lab reports. Volume of laboratory course will be given at the beginning of the semester.

Vurderingsordning

Assessment :

Written 4-hour examination.



Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BT201 Bioprocess technology

Emnekode: 2BT201

Studiepoeng: 15

Språk

English

Forkunnskaper

Recommended prerequisites: 2KJ231 Biochemistry or similar (completed previously or taken concurrently).

Læringsutbytte

Objectives:

The student shall understand the underlying principles of bioprocesses related to fermentation, downstream processing, and enzyme reactors, as well as analytical procedures. Student shall also acquire basic skills in performing experimental procedures with fermentation, adsorption chromatography, tangential filtration and biocatalyst immobilization, and to analyze data for computing process performance parameters.

Innhold

Course content:

Introduction to fundamental bioengineering and biochemical aspects of fermentation and bioreactor use, and purification strategies in downstream processing. Experimental design. Fermentation: Batch, fed-batch and continuous culture, growth curve and element balances. Growth models. Reactor operation and control. Separation techniques: Membrane filtration and protein chromatography. Strategy and scale up of separation processes. Protein electrophoresis. Enzyme technology and immobilization: Immobilization of biocatalysts and the use of enzyme reactors. Simple reaction kinetics, mass transport and film theory.

Organisering og arbeidsformer

Organisation and teaching methods:

Lectures, laboratory course, self-guided colloquiums.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements (for eligibility to take the examination) :



Approved lab reports (5).

Vurderingsordning

Assessment:

Portfolio that counts 40 % (includes a mid-term test (2 hours), and two lab reports selected by the instructor), and a written, 4-hour final examination that counts 60 %.

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2KJ231 Biochemistry

Emnekode: 2KJ231

Studiepoeng: 10

Språk

English

Forkunnskaper

Prerequisites: None

Læringsutbytte

Objectives:

Students shall have acquired knowledge about important biological molecules, and should be able to explain how molecule turnover occurs in the cell. Students shall also have acquired knowledge about the regulation of biomolecular processes in the cell, including the pathway from DNA to proteins.

Innhold

Course content:

Three main topics: 1) Building blocks in the cell - nucleic acids, amino acids, proteins, carbohydrates, fat. 2) Metabolism in the cell - enzymology, photosynthesis, carbohydrate-, fat-, nitrogen- and nucleic acid-metabolism. 3) Processing of information in the cell - replication, transcription and translation.

Organisering og arbeidsformer

Organisation and teaching methods: Lectures

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements: None

Vurderingsordning

Assessment: One written assignment that counts 30 %, and a written, 4-hour final examination that counts 70 %.

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap



2BI251 Molecular Biology

Emnekode: 2BI251

Studiepoeng: 10

Språk

English

Forkunnskaper

Prerequisites: Recommended prerequisites: 2BI131 Genetics or similar (completed previously or taken concurrently), and 2KJ231 Biochemistry or similar (completed previously or taken concurrently).

Læringsutbytte

Objectives:

Students shall learn the central concepts, principles and analytical methods employed in molecular genetics and integrate them with previous knowledge of classical genetics, cell biology, microbiology and biochemistry to develop a multidisciplinary understanding of molecular biology.

Innhold

Course content:

Introduction to the molecular biology of prokaryotic and eukaryotic cells and their viruses, including: mechanisms of DNA replication, repair and transcription; structure of genes and genomes; regulation of gene expression; chromatin structure; epigenetics; bioinformatics; modern methodology of molecular genetics.

Organisering og arbeidsformer

Organisation and teaching methods:

Lectures, self-organised colloquia, and independent study.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements: None

Vurderingsordning

Assessment: One written assignment that counts 30 %, and a written, 4-hour final examination that counts 70 %.

Ansvarlig avdeling



Avdeling for lærerutdanning og naturvitenskap



2BI131 Genetics

Emnekode: 2BI131

Studiepoeng: 10

Språk

English

Forkunnskaper

Prerequisites: None

Læringsutbytte

Objectives:

Students shall learn the central concepts, principles and analytical methods used in classical, chromosomal, bacterial/viral, population, quantitative and evolutionary genetics.

Innhold

Course content:

Introduction to classical, population, quantitative and evolutionary genetics, including: meiosis; Mendel's laws; probability; pedigree analysis; crosses (test-, back-, monohybrid-, dihybrid- etc.); recombination frequency and linkage analysis; gene mapping; chromosomal aberrations; transposable elements; allele frequency; Hardy-Weinberg equilibrium; natural selection; genetic drift; quantitative trait loci; heritability; marker-assisted breeding; variation and divergence; founder effect; molecular clocks.

Organisering og arbeidsformer

Organisation and teaching methods:

Lectures and discussion groups.

Obligatoriske krav som må være godkjent før man kan avlegge eksamen

Course requirements :

None

Vurderingsordning

Assessment: One written assignment that counts 30 %, and a written, 4-hour final examination that



counts 70 %.

Ansvarlig avdeling

Avdeling for lærerutdanning og naturvitenskap