AALBORG UNIVERSITET

STUDIEORDNING FOR KANDIDATUDDANNELSEN I BIOTEKNOLOGI, 2022

CIVILINGENIØR
AALBORG

MODULER SOM INDGÅR I STUDIEORDNINGEN

INDHOLDSFORTEGNELSE

EXPERIMENTAL MOLECULAR CELL BIOLOGY

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for the central molecular biology
- describe molecular and cell biology techniques used in research and industry
- account for transgenic techniques and design of relevant recombinant biotechnological products, including safety issues

SKILLS

- Select the best model organism or model system for given research question
- design and perform cellular and molecular biology based experiments in the laboratory
- write an electronic project report following the standards of the field of study, include relevant original scientific literature, use the correct terminology, and communicate the research-based foundation and problem and results in writing, graphically and orally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses the problem of the project and results in relevant scientific and social contexts

COMPETENCES

- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement academic assignments and interdisciplinary collaborations
- take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

- Project work

EXTENT AND EXPECTED WORKLOAD

450 hours

EXAM

EXAMS

Name of exam	Experimental Molecular Cell Biology
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Eksperimentel molekylær cellebiologi
Module code	K-BT-K1-48
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Teis Søndergaard

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

APPLIED MOLECULAR CELL BIOLOGY

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- describe complex molecular and cellular processes
- describe common model organisms and *in vitro* systems

SKILLS

- combine molecular techniques and model systems in order to study complex molecular and cellular processes
- analyse data from original scientific research papers
- critically evaluate conclusions presented in original scientific research papers
- compare and contrast different model organisms and *in vitro* systems

COMPETENCES

- reflect over original research papers and experimental designs
- generate hypotheses based upon scientific data
- design experiments using molecular biology techniques and model organisms

TYPE OF INSTRUCTION

Lectures

Original research papers

Theoretical exercises

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Applied Molecular Cell Biology
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Anvendt molekylær cellebiologi
Module code	K-BT-K1-60
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Teis Søndergaard

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

GENOMICS AND BIOINFORMATICS

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for the structure, structural elements and elements of evolution of genomes
- account for commonly used databases, search and visualization tools
- account for genotype/phenotype relationship
- describe homology of genomes and speciation – theory, tools and limitations
- account for and argue for choice of data mining algorithms
- provide overview of important public databases

SKILLS

- conduct de novo assembly of genomes
- conduct resequencing of genomes
- detect genomic variants
- carry out enome annotation, gene, repeat etc. prediction.
- carry out Functional annotation using public databases
- perform genome wide association analysis
- perform transcriptome analysis
- use predictive algorithms

COMPETENCES

- make correct interpretations of complex genomic data and hypothesis driven experimental designs

TYPE OF INSTRUCTION

Thematic workshops based on small online topic based talks, but with strong element of topic resolved theoretical exercises and student presentations.

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Genomics and Bioinformatics
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Genomik og bioinformatik
Module code	K-BT-K1-61
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Kåre Lehmann Nielsen

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

PROTEIN CHEMISTRY

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for the chemistry and thermodynamics behind protein structure, folding, stability and function, including the effect of protein modifications
- account for strength, specificity and cooperativity in ligand binding
- account for the principles and biophysical methods allowing isolation and purification of proteins
- outline principles and concepts in rational design, directed evolution, and semi-rational design of proteins
- account for screening techniques used for selection and/or screening of novel protein variants with improved properties

SKILLS

- select and apply biophysical methods for analysis of secondary, tertiary and quaternary structure of proteins
- apply theory on protein folding and stability to predict effect of mutations, insertions or deletions
- explain and select biophysical methods for analysis of ligand binding
- determine the binding strength from experimental data
- design purification strategies, allowing the isolation of pure preparations of proteins
- design recombinant proteins and processes for their purification
- develop strategies for obtaining mutants of protein with improved properties for industrial applications, using directed evolution technologies.
- apply theories on protein stability, ligand binding and protein engineering in the field of applied immunology to generate biologicals of therapeutic value.
- use online modelling tools to predict protein structure and ligand binding

COMPETENCES

- Read and understand advanced scientific articles in structural and analytical protein chemistry, protein engineering and directed evolution, with applications in industrial biotechnology and in applied immunology, with applications in medical biotechnology.

TYPE OF INSTRUCTION

- Lectures
- Theoretical exercises
- Student presentations

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Protein Chemistry

Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Proteinkemi
Module code	K-BT-K2-20A
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Peter Kristensen

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

PROJECT-ORIENTED STUDY IN AN EXTERNAL ORGANISATION

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- explain the scientific basis of the work carried out by the external organisation

SKILLS

- master the scientific methods and general skills related to the project work in the external organisation
- write an electronic project report following the standards of the field of study, use the correct terminology and document extensive use of relevant and original scientific literature, and communicate and discuss the project's research-based foundation and problem and results in writing, graphically and verbally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- critically assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses and discuss the problem of the project and results in relevant scientific and social contexts
- evaluate the potential of the project for further development, assessing and incorporating relevant economic, ethical, environmental and other societal relevant factors

COMPETENCES

- participate in and independently implement technological and scientific development and research, develop and implement experimental work and solve complex tasks using scientific methods
- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement independent academic assignments and interdisciplinary collaborations
- independently take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

Project work, supervised by an external supervisor in collaboration with an internal supervisor at Aalborg University

EXTENT AND EXPECTED WORKLOAD

900 hours

EXAM

EXAMS

Name of exam	Project-Oriented Study in an External Organisation
Type of exam	Oral exam based on a project
ECTS	30

Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Project work in an external organisation must be in areas of relevance to the competence profile of the program

FACTS ABOUT THE MODULE

Danish title	Projektorienteret forløb i en ekstern organisation
Module code	K-BT-K3-68A
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	30
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg, Campus Esbjerg
Responsible for the module	Lars Haastrup Pedersen
Time allocation for external examiners	B

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

MASTER'S THESIS

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- Explain the scientific basis and scientific issues within the competence profile of the education
- explain the highest international research within the thesis subject area

SKILLS

- master the scientific methods and general skills related to the thesis subject area
- write an electronic project report following the standards of the field of study, use the correct terminology and document extensive use of relevant and original scientific literature, and communicate and discuss the project's research-based foundation and problem and results in writing, graphically and verbally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- critically assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses and discuss the problem of the project and results in relevant scientific and social contexts
- evaluate the potential of the project for further development, assessing and incorporating relevant economic, ethical, environmental and other societal relevant factors

COMPETENCES

- participate in and independently implement technological and scientific development and research, develop and implement experimental work and solve complex tasks using scientific methods
- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement independent academic assignments and interdisciplinary collaborations
- independently take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

- Project work.

A long Master's thesis of more than 30 ECTS must include work of experimental nature and has to be approved by the Head of Studies. The amount of experimental work must reflect the allotted ECTS.

EXTENT AND EXPECTED WORKLOAD

1800 hours

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Master's thesis/final project
ECTS	60

Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	K-KMB-K4-4A
Module type	Project
Duration	2 semesters
Semester	Autumn
ECTS	60
Language of instruction	English
Responsible for the module	Lars Haastrup Pedersen
Time allocation for external examiners	D

ORGANISATION

Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

MASTER'S THESIS

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- Explain the scientific basis and scientific issues within the competence profile of the education
- explain the highest international research within the thesis subject area

SKILLS

- master the scientific methods and general skills related to the thesis subject area
- write an electronic project report following the standards of the field of study, use the correct terminology and document extensive use of relevant and original scientific literature, and communicate and discuss the project's research-based foundation and problem and results in writing, graphically and verbally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- critically assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses and discuss the problem of the project and results in relevant scientific and social contexts
- evaluate the potential of the project for further development, assessing and incorporating relevant economic, ethical, environmental and other societal relevant factors

COMPETENCES

- participate in and independently implement technological and scientific development and research, develop and implement experimental work and solve complex tasks using scientific methods
- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement independent academic assignments and interdisciplinary collaborations
- independently take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

900 hours

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Master's thesis/final project
ECTS	30
Assessment	7-point grading scale

Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	K-KMB-K4-5A
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	English
Responsible for the module	Lars Haastrup Pedersen
Time allocation for external examiners	D

ORGANISATION

Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

ENVIRONMENTAL BIOTECHNOLOGY

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The aim is to provide a fundamental understanding on how prokaryotes form consortia and biofilms, and how mixed microbial communities can be used to solve environmental challenges, such as production of bioenergy, reuse of resources, and production of clean water

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- describe microbial communities and biofilm formation and composition
- account for the formation, composition, growth and activity of mixed microbial communities
- account for transformations of C, N and P in mixed microbial communities
- describe the transformation of micropollutants
- demonstrate understanding of how mixed communities can be used to purify soil, water and air
- describe methodologies used to characterize microbial communities
- account for modern methods to determine activity of microorganisms directly in mixed communities. Hereunder the use of advanced microscopy for characterization of microorganisms in mixed cultures
- account for pathogenic bacteria in biofilms
- describe growth of human-related and pathogenic bacteria in biofilms
- demonstrate knowledge on principles for controlling wanted or unwanted prokaryotes in environmental biotechnology
- explain the use of mixed communities to clean soil, water and air for C, N and P
- explain the use of mixed communities for nutrient recovery and bioenergy production

SKILLS

- account for the role of prokaryotes in environmental biotechnology, and how to control them.
- account for molecular techniques to identify microorganisms and their activity in complex microbial ecosystems.
- describe different types of advanced microscopy for identification of microorganisms and their activities.

TYPE OF INSTRUCTION

- Lectures, theoretical exercises and hands-on laboratory exercises.

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Environmental Biotechnology
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Miljøbioteknologi
Module code	K-BT-K1-59
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Per Halkjær Nielsen, Jeppe Lund Nielsen

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

KEMISKE OG BIOLOGISKE UNDERVISNINGSFORSØG 2023/2024

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Kurset har til formål at give de studerende kendskab til en bred vifte af demonstrationsforsøg på gymnasialt niveau, således at de studerende kan udvælge, udvikle, begrunde og reflektere over valget af undervisningsforsøg til et givent gymnasialt undervisningsforløb i biologi, bioteknologi og kemi. Videre har kurset til formål at styrke de studerendes laboratoriemæssige og formidlingsmæssige færdigheder.

I tilknytning til emner fra lærerplanerne i Biologi, Bioteknologi og Kemi i gymnasiet udvælger de studerende en række forsøg, der tilrettelægges, gennemføres og afrapporteres. Udvalgte undervisningsforsøg gennemføres for underviser og medstuderende. Gennem diskussion og refleksion over de enkelte demonstrationsforsøg sikres en progression af de studerendes fagdidaktiske niveau.

LÆRINGSMÅL

VIDEN

Studerende, der gennemfører modulet, skal kunne

- give et overblik over velegnede demonstrationsforsøg på gymnasialt niveau.
- begrunde valg af (demonstrations-) forsøg ud fra fagets lærerplaner.
- tilrettelægge og gennemføre undervisningsforsøg.
- redegøre for sikkerhedsregler for eksperimentelt kemisk og biologisk arbejde i gymnasiet

FÆRDIGHEDER

- tilrettelægge og gennemføre demonstrationsforsøg og instruere og vejlede gymnasielever i deres eksperimentelle arbejde i kemi, biologi og bioteknologi.
- redegøre for praktiske og fagdidaktiske overvejelser vedrørende valg og udførelse af undervisningsforsøg.

KOMPETENCER

- reflektere over valg af didaktisk metode.
- udvikle eksperimenter til at understøtte og udvikle egen undervisning.

UNDERVISNINGSFORM

- Forelæsninger
- Workshops
- Feedback

OMFANG OG FORVENTET ARBEJDSINDSATS

150 arbejdstimer

EKSAMEN

PRØVER

Prøvens navn	Kemiske og biologiske undervisningsforsøg
Prøveform	Aktiv deltagelse/løbende evaluering I forbindelse med reeksamen vil prøveformen være skriftlig eller mundtlig.

ECTS	5
Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Chemical and biological experiments for teaching
Modulkode	K-KEM-K1-22
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Aalborg
Modulansvarlig	Thorbjørn Terndrup Nielsen, Jeppe Lund Nielsen

ORGANISATION

Uddannelsesejer	Cand.scient. i kemi
Studienævn	Studienævn for Kemi og Biovidenskab
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

PROTEIN SCIENCE

2023/2024

RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

It is recommendable that students following the project in Protein science also follow the course in Protein structure on 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for how to design, produce, purify, and characterize proteins
- describe how activity and stability of enzymes and other biotechnological relevant proteins can be determined
- account for the development of new preparative and analytical methods in protein science

SKILLS

- write an electronic project report following the standards of the field of study, include relevant original scientific literature, use the correct terminology, and communicate the research-based foundation and problem and results in writing, graphically and orally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses the problem of the project and results in relevant scientific and social contexts

COMPETENCES

- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement academic assignments and interdisciplinary collaborations
- take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

450 hours

EXAM

PREREQUISITE FOR ENROLLMENT FOR THE EXAM

- An approved PBL competency profile is a prerequisite for participation in the project exam

EXAMS

Name of exam	Protein Science
Type of exam	Oral exam based on a project

ECTS	15
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Proteinteknologi
Module code	K-BT-K2-38B
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Peter Kristensen

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

BIORESOURCES AND SUSTAINABLE DEVELOPMENT

2023/2024

RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

It is recommendable that students following the project in Bioresources and sustainable development also follow the course in Bioressurces and biorefineries on 2nd semester.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for world resources available for biological treatment and upgrading
- account for microbial, plant and metazoan resources employed by bioprocess technology
- account for available physical-chemical, enzymatic, and biological processes that are used to treat, reform and upgrade waste as well as high-value resources
- account for biological products of modern day’s bioprocess technology and the sustainability of their production and utilization

SKILLS

- Select and employ appropriate analyses for the characterization of relevant components and compounds in biomass and other types of ressources, considering the subsequent valorization by biotechnology
- design and perform experiments to evaluate the potential of a specific biomass as well as other resources available for bioprocessing
- evaluate the sustainability of technical processes, their role and potential in a circular bioeconomy for the green transition, and how technologies are related to the UN SDG goals
- write an electronic project report following the standards of the field of study, include relevant original scientific literature, use the correct terminology, and communicate the research-based foundation and problem and results in writing, graphically and orally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses the problem of the project and results in relevant scientific and social contexts

COMPETENCES

- devise appropriate process schemes including pre-treatment process, fermentation, purification, and down-stream processing for treatment, refining and upgrading of biomass and other resources, and evaluate their sustainability potential
- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement academic assignments and interdisciplinary collaborations
- take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

450 hours

EXAM

PREREQUISITE FOR ENROLLMENT FOR THE EXAM

- An approved PBL competency profile is a prerequisite for participation in the project exam

EXAMS

Name of exam	Bioresources and Sustainable Development
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Bioressourcer og bæredygtig udvikling
Module code	K-BT-K2-39
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Peter Stephensen Lübeck, Mette Lübeck

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

INSTRUMENTERING OG REGULERING AF PROCESSER

2023/2024

ANBEFALEDE FAGLIGE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået i Calculus, Reaktor og procesmodellering og Kemiske enhedsoperationer

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Modulet vil gennem miniprojekter introducere de studerende til procesdesign, herunder instrumentering og økonomi, samt procesregulering.

LÆRINGSMÅL

VIDEN

Studerende, som gennemfører kurset, skal kunne

- redegøre for procesdesign
- redegøre for instrumentering
- redegøre for procesregulering
- forklare PID design og tuning

FÆRDIGHEDER

- gengive systemer i blokdiagrammer
- opstille de nødvendige differentialligninger for at simulere et systems dynamik og anvende dem til at forudsige systemets respons ved påvirkning
- linearisere et ulineært system af differentialligninger
- løse lineære differentialligninger via Laplace transformation
- specificere de relevante reguleringskonstanter for et simpelt reguleringssystem
- designe og dimensionere processer, herunder valg af relevante instrumenter (pumper, ventiler, rør) med hensyntagen til instrumenternes kemiske og fysiske resistens
- opstille PI og PI&D diagrammer for processer
- udføre basal procesdesign og procesøkonomiske beregninger

UNDERVISNINGSFORM

- Forelæsninger
- Workshops
- Opgaveløsning (individuelt og i grupper)

OMFANG OG FORVENTET ARBEJDSINDSATS

150 arbejdstimer

EKSAMEN

PRØVER

Prøvens navn	Instrumentering og regulering af processer
Prøveform	Skriftlig eller mundtlig
ECTS	5

Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Instrumentation and regulation of processes
Modulkode	K-KEM-B6-49
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Aalborg
Modulansvarlig	Mads Koustrup Jørgensen

ORGANISATION

Studienævn	Studienævn for Kemi og Biovidenskab
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

ØKOLOGI OG ØKOTOKSIKOLOGI

2023/2024

ANBEFALEDE FAGLIGE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået i Almen kemi og Almen biologi

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Kurset består af forelæsninger og teoretiske øvelser, hvor der arbejdes med grundlæggende problemstillinger i økologi og økotoksikologi

LÆRINGSMÅL

VIDEN

Studerende, der gennemfører modulet, skal kunne

- beskrive økosystemers generelle organisation og funktion herunder biologiske interaktioner og dynamik, stof- og energifluks i økologiske netværk
- forklare begreber og metoder, der anvendes til vurdering af biologisk mangfoldighed og biodiversitet
- beskrive betydningen af naturlige og antropogene faktorer for økosystemers diversitet og funktion herunder betydning af resurser
- forklare metoder til måling af kemiske stoffers effekter på levende organismer
- forklare hovedprincipper bag optagelse, fordeling, omsætning og udskillelse af miljøfremmede stoffer i akvatiske og terrestriske organismer.
- beskrive centrale begreber der bruges til vurdering af kemiske stoffers skæbne og effekt på forskellige trofiske niveauer i et økosystem
- redegøre for hovedelementer i beskrivelse af økosystemprocesser herunder stabilitet af økosystemer
- redegøre for hovedelementer, der indgår i økotoksikologiske risikovurderinger

FÆRDIGHEDER

- analysere afgrænsede problemstillinger i økologi og økotoksikologi med inddragelse af relevant teori

KOMPETENCER

- udføre vurdering af afgrænsede problemstillinger i økologi og økotoksikologi med inddragelse af relevant teori

UNDERVISNINGSFORM

- Forelæsninger
- Opgaveløsning
- Lærerfeedback

OMFANG OG FORVENTET ARBEJDSINDSATS

150 arbejdstimer

EKSAMEN

PRØVER

Prøvens navn	Økologi og økotoksikologi

Prøveform	Skriftlig eller mundtlig
ECTS	5
Bedømmelsesform	7-trins-skala
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Ecology and Ecotoxicology
Modulkode	K-BIO-B4-24A
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Aalborg
Modulansvarlig	Peter Roslev

ORGANISATION

Uddannelsesejer	Bachelor (BSc) i biologi
Studienævn	Studienævn for Kemi og Biovidenskab
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

PROTEIN STRUCTURE

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

SKILLS

Students who have passed the module should be able to

- Predict and model protein structures from sequence data
- Give an account of state-of-the-art techniques for the investigation and determination of structure, including the procedures involved, prerequisites and the advantages and shortcomings of each of these techniques
- Extract and model biomolecular structural data from relevant databases
- Visualize structures and utilize structural data to explain biomolecular function
- Give an account of classification of protein structures

COMPETENCES

- Read and understand scientific articles on the determination, interpretation and application of biomolecular structures

TYPE OF INSTRUCTION

- Lectures
- Theoretical exercises

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Protein Structure
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Proteinstruktur
Module code	K-BT-K2-21
Module type	Course
Duration	1 semester

Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Reinhard Wimmer

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

BIORESSOURCES AND BIOREFINERIES

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- provide an overview of accessibility and sustainability related to different biomass sources and their conversion processes
- account for existing biorefinery concepts, classification systems and technologies
- compare different types of biorefineries with each other and with oil refineries and relate the refineries in a green transition context and with respect to the UN SDG goals

SKILLS

- evaluate biomasses with respect to their applicability in biorefineries and outline which yields and qualities that are associated with applicability
- identify and analyze the limitations by existing physical-chemical, thermochemical, and biological methods for biomass conversion
- set up mass and energy balances for different biomass conversions
- apply one or more of the general calculation models for estimation of costs and energy efficiency in the conversion of different biomasses into different products

COMPETENCES

- devise suitable biorefinery techniques for the conversion biomass into specific products
- evaluate environmental consequences of biorefinery activities
- evaluate biorefinery concepts in relation to green transition and to the UN SDG goals

TYPE OF INSTRUCTION

- Lectures
- Theoretical exercises

EXTENT AND EXPECTED WORKLOAD

150 hours

EXAM

EXAMS

Name of exam	Bioressources and Biorefineries
Type of exam	Active participation/continuous evaluation In connection with reexaminations, the examination form will be written or oral.
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Bioressourcer og bioraffinaderier
Module code	K-BT-K2-22
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg, Campus Esbjerg
Responsible for the module	Mette Lübeck, Jens Laurids Sørensen

ORGANISATION

Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science

MEDICAL PROTEIN SCIENCE

2023/2024

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who have passed the module should be able to

- account for how to design, produce, purify, and characterize proteins
- describe how activity and stability of enzymes and medical relevant proteins, including antibodies, anti-microbial peptides, and other therapeutic proteins can be determined
- account for the development of new preparative and analytical methods in protein science

SKILLS

- write an electronic project report following the standards of the field of study, include relevant original scientific literature, use the correct terminology, and communicate the research-based foundation and problem and results in writing, graphically and orally in a professionally reasoned and coherent way
- use relevant software to present, analyze and visualize theories, hypotheses and data in writing as well as orally
- assess and select relevant original scientific literature and current scientific methods, models and other tools used in the project and asses the problem of the project and results in relevant scientific and social contexts

COMPETENCES

- handle the planning, implementation and management of complex and unpredictable research and/or developmental tasks and take professional responsibility to implement academic assignments and interdisciplinary collaborations
- take responsibility for own professional development and specialization

TYPE OF INSTRUCTION

Project work

EXTENT AND EXPECTED WORKLOAD

450 hours

EXAM

PREREQUISITE FOR ENROLLMENT FOR THE EXAM

- An approved PBL competency profile is a prerequisite for participation in the project exam

EXAMS

Name of exam	Medical Protein Science
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale

Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Medicinsk Proteinteknologi
Module code	K-BT-K2-41B
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Peter Kristensen
Time allocation for external examiners	B

ORGANISATION

Education owner	Master of Science (MSc) in Engineering (Biotechnology)
Study Board	Study Board of Chemistry and Bioscience
Department	Department of Chemistry and Bioscience
Faculty	The Faculty of Engineering and Science