



AALBORG UNIVERSITET

**DIPLOMINGENIØR I KEMI OG  
BIOTEKNOLOGI;  
PROFESSIONSBACHELOR I  
INGENIØRVIRKSOMHED, 2017  
(ESBJERG)**

DIPLOMINGENIØR  
ESBJERG

## MODULER SOM INDGÅR I STUDIEORDNINGEN

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# KEMISKE OG BIOINDUSTRIELLE PRODUKTER I

## 2019/2020

### MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

#### LÆRINGSMÅL

##### VIDEN

Studerende, der gennemfører modulet

- Skal kunne forklare grundlæggende aspekter indenfor kemi, miljø og sundhed

##### FÆRDIGHEDER

- Formidle projektets problemstilling og resultater skriftligt og mundtligt
- Udarbejde en problemformulering som identificerer en problemstilling og danner grundlag for videre arbejde indenfor projekts fagområde

##### UNDERVISNINGSFORM

- Projektarbejde

##### OMFANG OG FORVENTET ARBEJDSINDSAT

150 timer

### EKSAMEN

#### PRØVER

Prøvens navn	Kemiske og bioindustrielle produkter I
Prøveform	Mundtlig pba. projekt
ECTS	5
Bedømmelsesform	7-trins-skala
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

### FAKTA OM MODULET

Engelsk titel	Chemical and Bio Industrial Products I
Modulkode	K-KT-B1-12
Modultype	Projekt
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk

Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Jens Muff</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# KEMISKE OG BIOINDUSTRIELLE PRODUKTER II

**2019/2020**

## FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået i Kemiske og bioindustrielle produkter I

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne

- Definere og forklare de i projektet anvendte metoder, teorier og modeller

#### FÆRDIGHEDER

- Arbejde sikkert i laboratoriet, herunder vurdere og anvende relevante beskyttelsesforanstaltninger, benytte relevante kilder til information, håndtere kemikalier og andet materiale forsvarligt, bortskaffe spild og affald efter forskrifter samt udarbejde arbejdspladsbrugsanvisninger
- Formidle projektets problemstilling og resultater skriftligt, grafisk og mundtligt på en sammenhængende måde

#### KOMPETENCER

- Varetage planlægning og gennemførelse af et projekt
- Identificere og udvikle egne muligheder for fortsat videreuddannelse indenfor fagområdet

#### UNDERVISNINGSFORM

- Projektarbejde

#### OMFANG OG FORVENTET ARBEJDSINDSAT

300 timer

## EKSAMEN

### FORUDSÆTNING FOR INDSTILLING TIL PRØVEN

- Godkendt prøve i laboratoriesikkerhed er forudsætning for deltagelse i projekteksamen

### PRØVER

Prøvens navn	Kemiske og bioindustrielle produkter II
Prøveform	Mundtlig pba. projekt
ECTS	10
Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve

Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning
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## FAKTA OM MODULET

Engelsk titel	Chemical and Bio Industrial Products II
Modulkode	K-KT-B1-11
Modultype	Projekt
Varighed	1 semester
Semester	Efterår
ECTS	10
Undervisningsprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Jens Muff</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# PROBLEMBASERET LÆRING I VIDENSKAB, TEKNOLOGI OG SAMFUND

**2019/2020**

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

- Viden der gør den studerende i stand til at:
  - Redegøre for den grundlæggende læringsteori
  - Redegøre for teknikker til planlægning og styring af projektarbejde
  - Redegøre for forskellige tilgange til problembaseret læring (PBL); herunder Aalborg modellens udgangspunkt i problemer, der indgår i en samfundsmæssig og/eller humanistisk sammenhæng
  - Redegøre for forskellige tilgange til analyse og vurdering af ingeniør, natur og sundhedsvidenskabelige problemstillinger og løsninger i et videnskabsteoretisk, etisk og samfundsmæssigt perspektiv
  - Redegøre for konkrete metoder inden for fagområdet til at udføre denne analyse og vurdering

#### FÆRDIGHEDER

- Færdigheder der gør de studerende i stand til at:
  - Planlægge og styre et problembaseret studieprojekt
  - Analysere projektgruppens organisering af gruppesamarbejdet med henblik på at identificere stærke og svage sider, og på den baggrund komme med forslag til, hvordan samarbejdet i fremtidige grupper kan forbedres
  - Reflektere over årsager til og anvise mulige løsninger på eventuelle gruppekonflikter
  - Analysere og vurdere egen studieindsats og læring med henblik på at identificere stærke og svage sider, og der ud fra overveje videre studieforløb og studieindsats
  - Reflektere over de anvendte metoder i et videnskabsteoretisk perspektiv
  - Udpege relevante fokusområder, begreber og metoder til at vurdere og udvikle løsninger under hensynstagen til de samfundsmæssige og humanistiske sammenhænge i hvilke løsningen skal indgå

#### KOMPETENCER

- Kompetencer, som gør den studerende i stand til at:
  - Indgå i et teambaseret projektarbejde
  - Formidle et projektarbejde
  - Reflektere og udvikle egen læring bevidst
  - Indgå i og optimere kollaborative læreprocesser
  - Reflektere over sit professionelle virke i relation til det omgivende samfund

#### UNDERVISNINGSFORM

Kurset er organiseret som et mix af forelæsninger, seminarer, workshops, gruppekonsultation og selvstudie.

#### OMFANG OG FORVENTET ARBEJDSINDSATS

Kursusmodulets omfang er 5 ECTS svarende til 150 timers studieindsats.

#### EKSAMEN

#### PRØVER

Prøvens navn	Problembaseret læring i videnskab, teknologi og samfund
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Prøveform	Skriftlig Kurset eksamineres individuelt på baggrund af en skriftlig opgave.
ECTS	5
Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

## FAKTA OM MODULET

Engelsk titel	Problem-based Learning in Science, Technology and Society
Modulkode	N-EN-B1-5
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Aalborg, Campus Esbjerg, Campus København
Modulansvarlig	<a href="#">Annette Grunwald</a> , <a href="#">Søren Rosenlund Frimodt-Møller</a>

## ORGANISATION

Studienævn	Studienævn for Energi
Institut	Institut for Energiteknik
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# ALMEN KEMI

2019/2020

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne

- Redegøre for fundamentale kemiske og fysisk-kemiske principper for kemiske reaktioner og ligevægte
- Redegøre for atomers struktur, kemiske bindinger og intermolekylære kræfter
- Redegøre for atomers orbitaler, elektronkonfiguration og den fysiske beskrivelse af atomer som giver anledning til deres placering i det periodiske system
- Forklare forskellige modeller for molekylorbitaler til beskrivelse af kovalente bindinger og molekylers geometri
- Redegøre for fundamentale forskelle på redox reaktioner, syre-base reaktioner, opløselighedsreaktioner og kemisk kompleksdannelse
- Redegøre for fundamental termodynamik
- Redegøre for fundamental elektrokemi, inklusiv galvaniske elementer og elektrolyse
- Redegøre for fundamental reaktionskinetik og kunne forklare reaktionshastigheder og orden for udvalgte reaktioner
- Forklare atomers, ioners og molekylers elektronkonfiguration og den tilhørende geometri baseret på orbital og VSEPR teori

#### FÆRDIGHEDER

- Afstemme kemiske reaktioner og udføre støkiometriske beregninger og massebalancer
- Beregne pH og redoxpotentialer for relevante ligevægte
- Beregne entalpi, entropi og Gibbs fri energi for kemiske reaktioner
- Opstille Nernst ligning for et elektrokemisk system til beregning af cellepotentialet
- Beregne udbyttet af elektrolytiske reaktioner
- Opstille matematiske modeller til beskrivelse af reaktionshastighed, forklare den overordnede såvel som indgående komponenters reaktionsorden og hvilke parametre der indgår i hastighedskonstanten
- Modellere reaktionshastigheden for simple reaktionsmekanismer for at simulere og illustrere forløbet for en kemisk reaktion

#### KOMPETENCER

- Planlægge og udføre simple kemiske forsøg ud fra viden om de kemiske og fysisk-kemiske betingelser, hvorunder sådanne kemiske reaktioner foregår

#### UNDERVISNINGSFORM

- Forelæsninger samt teoretiske og praktiske øvelser

#### OMFANG OG FORVENTET ARBEJDSINDSAT

150 timer

## EKSAMEN

### PRØVER

Prøvens navn	Almen kemi
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	General Chemistry
Modulkode	K-KT-B1-31
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Jens Muff</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# CALCULUS

2019/2020

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in Linear Algebra or similar

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module

- Should have knowledge about definitions, results and techniques within the theory of differentiation and integration of functions of two or more variables
- Should know trigonometric functions and their inverse functions
- Should have knowledge about simple surfaces in right-angled, polar and spherical coordinates
- Should have knowledge about complex numbers their calculation rules and representations
- Should have knowledge about factorization of polynomials of complex numbers
- Should have knowledge about the complex exponential function, its properties and its connection with trigonometric functions
- Should have knowledge about the theory for second order linear differential equations with constant coefficients

#### SKILLS

- Can visualize functions of two and three variables by means of graphs, level curves and level planes
- Can determine local and global extremes for functions of two and three variables
- Can determine area, volume, inertia moment by use of integration theory
- Can approximate functions of a variable by means of Taylor's equation and use linear approximation for functions with two or three variables
- Are capable of calculations using complex numbers
- Can find the roots of the complex quadratic equation and perform factorization of polynomials in simple cases
- Can solve linear second order differential equations with constant coefficients, generally and with starting conditions
- Can reason with the concepts, results and theories of the course in simple concrete and abstract problems

#### COMPETENCES

- Can develop and strengthen the knowledge, understanding and application of mathematical theories and methods within other fields
- Can reason and argue using mathematical concepts from given prerequisites

#### TYPE OF INSTRUCTION

Lectures and calculation exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Calculus
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	Calculus
Module code	K-BBT-B2-14
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	<a href="#">Bedia Akyar Møller</a>

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# KEMISKE REAKTIONER I NATURLIGE OG TEKNISKE SYSTEMER

**2019/2020**

## FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået i Kemiske og bioindustrielle produkter II

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne

- Beskrive grundlæggende begreber, modeller, teorier og metoder anvendt i projektet

#### FÆRDIGHEDER

- Vælge og anvende relevante modeller, teorier og metoder indenfor projektarbejds område
- Planlægge og udføre kemiske forsøg i laboratoriet på sikkerhedsmæssig forsvarlig måde, føre journal over forsøgsgangen og drage relevante konklusioner af de opnåede resultater
- Opbygge en projektrapport efter fagområdets normer og formidle projektets problemstilling og resultater skriftligt, grafisk og mundtligt på en sammenhængende måde, herunder sammenhæng mellem problemformulering, projektets udførelse og væsentligste konklusioner
- Sætte projektets problemstilling og resultater i relevant faglig og samfundsmæssig kontekst og identificere relevante interessenter

#### KOMPETENCER

- Organisere gruppesamarbejde og samarbejde med vejledere samt varetage planlægning, gennemførelse og styring af et projekt under hensyntagen til tidligere erfaringer
- Identificere og udvikle egne muligheder for fortsat videreuddannelse indenfor fagområdet

#### UNDERVISNINGSFORM

- Projektarbejde

#### OMFANG OG FORVENTET ARBEJDSINDSAT

450 timer

#### EKSAMEN

#### PRØVER

Prøvens navn	Kemiske reaktioner i naturlige og tekniske systemer
Prøveform	Mundtlig pba. projekt
ECTS	15
Bedømmelsesform	7-trins-skala

Censur	Ekstern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

## FAKTA OM MODULET

Engelsk titel	Chemical Reactions in Natural and Technical Systems
Modulkode	K-KT-D2-4
Modultype	Projekt
Varighed	1 semester
Semester	Forår
ECTS	15
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Jens Muff</a>
Censornorm	B

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# BIOLOGISK AKTIVE MOLEKYLER – INTRODUKTION TIL CELLEBIOLOGI OG BIOLOGISK KEMI

**2019/2020**

## FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger videre på viden opnået i Almen kemi

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne

- Redegøre for cellers opbygning
- Redegøre for biologisk aktive molekylers strukturer, egenskaber og funktion
- Forklare den cellulære energiomsætning
- Redegøre for DNA opbygning og replikation
- Redegøre for bioteknologiske teknologier
- Redegøre for proteins opbygning og funktion
- Redegøre for lipider og membranners opbygning og funktion
- Beskrive cellen, dens organeller og indholdsstoffer
- Redegøre for metabolisme
- Redegøre for energiomsætningen i celler
- Redegøre for enzyms virkemåde og regulering
- Redegøre for hvordan DNA kan bruges i moderne rekombinante teknologier
- Redegøre for samspillet mellem kemi og biologi på celleniveau

#### FÆRDIGHEDER

- Anvende faglitteratur om cellebiologiske emner

#### UNDERVISNINGSFORM

Forelæsninger samt teoretiske og praktiske øvelser

#### OMFANG OG FORVENTET ARBEJDSINDSAT

150 timer

## EKSAMEN

### PRØVER

Prøvens navn	Biologisk aktive molekyler – introduktion til cellebiologi og biologisk kemi
Prøveform	Skriftlig eller mundtlig
ECTS	5
Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve



Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning
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## FAKTA OM MODULET

Engelsk titel	Biological Active Molecules – Introduction to Cell Biology and Biological Chemistry
Modulkode	K-KT-B2-32
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Jens Muff</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# GRUNDLÆGGENDE KEMISK PROCESTEKNIK OG TERMODYNAMIK

**2019/2020**

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

- Redegøre for grundlæggende procestekniske begreber, herunder systemer, systemgrænser, procestyper, procesenheder og procesvariable
- Redegøre for begreberne energi, energioverførsel og effekt
- Redegøre for systematikken for opstilling og beregning af balanceligninger
- Forklare termodynamikkens hovedsætninger
- Redegøre for ideale gasser
- Redegøre for varme, arbejde og indre energi
- Redegøre for termodynamiske materialeegenskaber
- Redegøre for Boltzmann-fordelingen
- Forklare entropi
- Forklare enthalpi og kunne definere standard enthalpiændringer ved fysiske processer og kemiske reaktioner
- Redegøre for Gibbs fri energi, fasejævte for rene stoffer samt faseagrammer
- Redegøre for kemisk potentiale og termodynamisk ligevægt for kemiske reaktioner

#### FÆRDIGHEDER

- Læse procesagrammer
- Foretage en relevant afgrænsning og/eller opdeling af en given teknisk, kemisk eller biologisk proces og udfærdige et blok- eller procesagram herfor
- Omregne mellem enheder
- Opstille og løse massebalancer for stationære ikke-reaktive systemer og reaktive systemer
- Regne på ideale gasser og ideale gasblandinger
- Estimere kompressibilitetsfaktoren for en real gas ved givne procesbetingelser
- Anvende faseagrammer og damp-tabeller
- Foretage termokemiske beregninger
- Beregne ligevægtsforhold på baggrund af termodynamiske data
- Opstille og løse energibalancer for stationære systemer
- Anvende metoder og teorier inden for kemisk procesteknik og termodynamik på simple modelsystemer

#### KOMPETENCER

- Anvende den termodynamiske teori og de procestekniske metoder til at forstå, beskrive og løse problematikker inden for fagområder som analytisk kemi, materialelære, separationsteknik, kemisk reaktionsteknik og procesdesign

#### UNDERVISNINGSFORM

Forelæsninger og teoretiske øvelser

#### OMFANG OG FORVENTET ARBEJDSINDSAT

150 timer

## EKSAMEN

### PRØVER

Prøvens navn	Grundlæggende kemisk processteknik og termodynamik
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	Fundamental Chemical Engineering and Thermodynamics
Modulkode	K-KT-D2-2
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Inge-Lise Hansen</a>

### ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# LINEAR ALGEBRA

2019/2020

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

- Use of derived functions
- Integrals and integration techniques
- Indefinite, definite and improper integrals
- Use of definite integrals
- Polar coordinates and parametric equations
- Function series
- Ordinary 1<sup>st</sup> and 2<sup>nd</sup> order differential equations
- Partial differential equations
- Linear algebra and analytical geometry
- Vectors and vector spaces
- Determinant and linear systems
- Matrices, determinants and linear equation systems

## LEARNING OBJECTIVES

### KNOWLEDGE

Students who have passed the module should be able to

- Understand differentiation and integration of simple mathematical functions
- Understand and interpret simple mathematical problems including solutions to differential equations
- Understand simple problems in linear algebra

### SKILLS

- Calculate differentials and integrals of simple functions
- Solve ordinary 1<sup>st</sup> and 2<sup>nd</sup> order differential equations
- Solve systems of algebraic equations

## TYPE OF INSTRUCTION

Lectures and exercises

## EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Linear Algebra
Type of exam	Written exam 4 hours
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	Lineær algebra
Module code	K-BBT-B1-19
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	<a href="#">Johan Rønby Pedersen</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# ANALYSIS OF CHEMICAL SYSTEMS

2019/2020

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Explain the fundamental physical principles that underlie the chemical analysis apparatus used in the project
- Explain the fundamental physical principles underlying alternatives to the selected instrumental chemical analysis techniques
- Explain the chemistry that underlies sample preparation to the instrumental chemical analysis techniques that are selected above
- Describe standard statistical methods used in analytical chemistry

#### SKILLS

- Perform relevant stoichiometric calculations and use ordinary glassware in the laboratory
- Perform analytical chemical experiments in accordance with the regulatory and achieve a reproducible result
- Write down and reconcile all chemical reaction schemes that underlie the analysis regulatory
- Calculate the thermodynamic affinity for the reactions used in the basis of the analysis
- Perform the relevant statistical calculations on the results and select one of the analytical methods for validation
- Perform general uncertainty calculations on the results obtained
- Explain safety rules and phrases for the analysis and the chemicals used
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of methods, models and other tools used in the project and asses the problem of the project and results in relevant professional contexts

#### COMPETENCES

- Select the best possible analytical equipment in the laboratory for a chemical analysis of a given product or a process, taking economic and temporal factors into account
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### TYPE OF INSTRUCTION

- Project work

#### EXTENT AND EXPECTED WORKLOAD

450 hours

### EXAM

#### EXAMS

Name of exam	Analysis of Chemical Systems
Type of exam	Oral exam based on a project

ECTS	15
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	Analyse af kemiske systemer
Module code	K-KT-B3-13
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Morten Enggrob Simonsen</a>
Time allocation for external examiners	B

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# METHODS IN QUANTITATIVE CHEMICAL ANALYSIS

2019/2020

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Explain the fundamental physical principles governing selected apparatus for instrumental chemical analysis, including chromatographic and spectroscopic techniques
- Explain the fundamental physical principles forming the basis for alternatives to the selected instrumental chemical analysis methods
- Account for the chemistry that forms the basis of sample preparation for the above selected instrumental chemical analysis techniques
- Account for spectroscopic methods that may be utilized for qualitative analysis of various organic, inorganic or organometallic substances

#### SKILLS

- Perform relevant stoichiometric calculations and use common glassware in the laboratory
- Perform analytical chemical experiments based on written instructions and achieve a reproducible result
- Write and balance any and all chemical reaction schemes forming the foundation of the instructions for the analysis
- Calculate the thermodynamic affinity for the applied reactions from the point of reference
- Perform relevant statistical calculations on the results of a series of analysis on selected instruments
- Perform general calculations of the uncertainty in the measurements based on the obtained results
- Identify appropriate experimental methods for qualitative determination of substance properties

#### COMPETENCES

- Select and evaluate imaginable analysis equipment in the laboratory for a chemical analysis of a product or a given process under consideration of time and economical aspects

#### TYPE OF INSTRUCTION

- Lectures, laboratory exercises and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Methods in Quantitative Chemical Analysis
Type of exam	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
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## FACTS ABOUT THE MODULE

Danish title	Metoder til kvantitativ kemisk analyse
Module code	K-KT-B3-2
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Morten Enggrob Simonsen</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# INORGANIC AND ORGANIC CHEMISTRY

2019/2020

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Explain the concept of activity and activity coefficients of ions in solution
- Explain the fundamental thermodynamics underlying the calculation of equilibrium constants of coupled equilibria systems
- Describe properties of solids that rely on the atomic structure of metals and ionic compounds
- Describe stereochemistry and coordination chemistry of chemical complexation
- Explain bonding of organic carbon-based compounds and stereochemistry
- Account for functional groups, nomenclature, common trivial names and physical properties
- Account for reactive intermediates (radicals, carbocat-ions, and anions)
- Describe reaction mechanisms of organic reactions
- Explain product distribution and synthesis strategy
- Account for methods for the purification and isolation of organic chemicals
- Account for the influence of ionic strength (non-ideality) when doing calculations on chemical reactions in solution
- Explain the models for the structure of chemical complexation based on electron configuration

#### SKILLS

- Couple several chemical equilibria of both homogeneous and heterogeneous nature and to perform the necessary calculations for determination of the equilibrium state of the coupled system
- Explain various equilibrium diagrams with a particular focus on redox reactions
- Deduce important properties of chemical compounds using the periodic table of elements
- Apply the knowledge achieved in the course for analysis of the chemistry of a main group and other trends in the periodic table
- Apply the fundamental concepts of isotope and nuclear chemistry
- Use the nomenclature rules to read, interpret and disseminate information related to organic chemicals
- Write reaction mechanisms, stereochemistry and product distributions for selected ionic, organometallic and radical reactions
- Based on synthesis protocols, draw a block diagram showing all steps in the synthesis and the subsequent purification procedure

#### COMPETENCES

- Alter reaction pathways in order to achieve a preferred or particular outcome of a process
- Apply own knowledge of organic chemistry in technical, biological and ecological contexts

#### TYPE OF INSTRUCTION

- Lectures, laboratory exercises, theoretical exercises and workshops

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Inorganic and Organic 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	Uorganisk og organisk kemi
Module code	K-KT-B3-3
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Jens Muff</a>

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# APPLIED STATISTICS

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in Linear Algebra and Calculus

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Describe basic concepts of probability theory, statistics and quality control
- Account for relevant statistical software for solving problems in statistics and quality control

#### SKILLS

- Choose the right probability model and perform calculations according to the model. This applies to both discrete and continuous distributions
- Handle both one-dimensional as well as multi-dimensional random variables and the related distributions, discrete and continuous
- Calculate the mean, standard deviation for one-dimensional random variables and also be introduced into the calculation and understanding of covariance for multi-dimensional random variables
- Select the right statistical method and make calculations of confidence intervals and do hypothesis testing for one and two random samples, make analysis of variance and regression analysis in terms of continuous as well as discrete probability distributions
- Establish and solve problems in process control and product control, this applies both within continuous as an alternative variation
- Handle both traditional solution techniques as well as software based solutions
- Interpret the results obtained from the correct statistical method including their application
- Set up and use non-parametric tests on qualitative data

#### COMPETENCES

- Engage in a dialogue regarding the optimal choice of method within probability theory, statistics and quality control
- Disseminate the results of the calculations to others, including colleagues, public authorities, etc.

#### TYPE OF INSTRUCTION

- Lectures and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Applied Statistics
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 statistik
Module code	K-KT-B3-30
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Svante Eriksen</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# CHEMICAL THERMODYNAMICS AND SEPARATION PROCESS ENGINEERING

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in:

Chemical and Bio Industrial Products II

Fundamental Chemical Engineering and Thermodynamics

Inorganic and Organic Chemistry

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for models for non-ideal gasses
- Explain theoretical and empirical models for phase equilibrium of pure species
- Account for mixtures, including partial properties, chemical potentials, fugacity, activity, coefficient of activity and must know models for phase equilibrium in mixtures
- Explain the theory and design of industrial separation processes, especially staged equilibrium processes as distillation, absorption and extraction
- Explain the functioning of separation process equipment used in chemical equilibrium processes

#### SKILLS

- Differentiate between ideal and non-ideal gasses and to use simple models of non-ideal gasses
- Write equation for thermodynamic equilibrium in ideal and in non-ideal mixtures and solutions
- Evaluate if a given chemical mixture can be separated and which methods could be applicable
- Use thermodynamic data to dimension simple equilibrium processes
- Write and use mass, energy and equilibrium relations to find the required number of equilibrium stages for a given separation of a binary mixture

#### COMPETENCES

- Describe, model and solve problems in separation process engineering

#### TYPE OF INSTRUCTION

Lectures and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Chemical Thermodynamics and Separation Process Engineering
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	Fysisk-kemiske separationsprocesser
Module code	K-KT-B4-3
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Rudi P. Nielsen</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# **MICROBIAL BIOTECHNOLOGY**

**2019/2020**

## **PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE**

The module adds to the knowledge obtained in:

Biological Active Molecules – Introduction to Cell Biology and Biological Chemistry

General Chemistry

Inorganic and Organic Chemistry

## **CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE**

### **LEARNING OBJECTIVES**

#### **KNOWLEDGE**

Students who have passed the module should be able to

- Describe the cell as a biological entity
- Account for prokaryotic and eukaryotic cell structures
- Account for energy conversion in microorganisms
- Describe biochemical analysis methods
- Describe technically important microorganisms, their nutrition, metabolism and growth
- Account for microbial genetics
- Describe microbiological analysis methods
- Explain good microbiological practice

#### **SKILLS**

- Establish and calculate growth curves for microbiological growth
- Perform biochemical and microbiological tests in the laboratory in a safe way
- Handle experimental work with microorganisms, evaluate and use appropriate protective measures, work with sterile techniques, use relevant sources of information, and dispose of waste according to regulations

#### **COMPETENCES**

- Utilize knowledge on biochemical molecules, processes and systems, for projects in technical microbiology, food technology or for biotechnology development or production

#### **TYPE OF INSTRUCTION**

Lectures and theoretical exercises

#### **EXTENT AND EXPECTED WORKLOAD**

150 hours



## EXAM

### EXAMS

Name of exam	Microbial 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	Mikrobiel bioteknologi
Module code	K-KT-B4-4
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Jens Laurids Sørensen</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# **MATERIAL SCIENCE AND MATERIAL SELECTION**

**2019/2020**

## **PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE**

The module adds to the knowledge obtained in:

Linear Algebra

Calculus

Fundamental Chemical Engineering and Thermodynamics

## **CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE**

### **LEARNING OBJECTIVES**

#### **KNOWLEDGE**

Students who have passed the module should be able to

- Explain the fundamental structure and properties of metals, polymers, ceramics and composites
- Account for equilibrium and non-equilibrium diagrams
- Account for the selection of materials
- Account for material processing, including joining and surface treatment
- Explain the fundamental mechanisms in corrosion and wear/abrasion
- Describe material testing and the applicability of results gained from testing

#### **SKILLS**

- Carry out a material selection and select an appropriate processing method for such material
- Identify materials through acquired methods for material testing
- Evaluate if a material is suitable for a given purpose based on the properties of the material
- Select materials for a given application
- Select a processing method and method for joining of materials if required

#### **COMPETENCES**

- Evaluate the properties and applicability of a given material for engineering purposes
- Evaluate if a material will be subject to chemical or mechanical degradation in a given environment, and if needed subsequently select an appropriate surface treatment or substitution of the material

### **TYPE OF INSTRUCTION**

Lectures and theoretical exercises

### **EXTENT AND EXPECTED WORKLOAD**

150 hours

## EXAM

### EXAMS

Name of exam	Material Science and Material Selection
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	Materialelære og materialevalg
Module code	K-KT-B4-5
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Morten Enggrob Simonsen</a>

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# CHEMICAL REACTION ENGINEERING

2019/2020

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Fundamental Chemical Engineering and Thermodynamics, General Chemistry, Inorganic and organic chemistry

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Explain fundamental concepts of chemical reaction engineering
- Account for ideal and non-ideal chemical reactors and reactor systems
- Describe the development of kinetic models on the basis of chemical reaction mechanisms
- Explain how reactor design and process conditions can be used to optimize yield and product distribution
- Explain the principles for catalysis and catalytic reactions
- Describe the reaction systems for major chemical and biotechnological products

#### SKILLS

- Analyze kinetic data from ideal reactors
- Set up rate equations for chemical and biochemical reactions based on knowledge of reaction mechanisms
- Set up and test rate equations from kinetic data
- Set up and solve equations for analysis and design of ideal reactors or reactor systems operating isothermally or adiabatically
- Optimize yield and selectivity of multiple reactions
- Model and analyze reactors for chemical or biochemical industrial reactions

#### COMPETENCES

- Apply the knowledge of kinetics and reactor design to the modelling systems for e.g. natural processes

#### TYPE OF INSTRUCTION

- Lectures and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Chemical Reaction Engineering
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	Kemisk reaktionsteknik
Module code	K-KT-B5-4
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Marco Maschietti</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# THERMODYNAMIC, HEAT TRANSFER AND FLUID MECHANICS

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Fundamental Chemical Engineering and Thermodynamics

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for fundamental thermodynamics, fluid mechanics and heat transfer
- Account for fundamental thermodynamics
- Account for fundamental fluid mechanics
- Account for fundamental convection
- Account for heat transfer in thermal networks
- Account for heat exchangers

#### SKILLS

- Apply thermodynamics to solve engineering problems
- Use the energy equation on flow in piping with different components such as pumps, valves, bends and nozzles
- Use fundamental fluid mechanics to analyse external flow around objects
- Calculate heat transfer in thermal networks
- Calculate heat transfer coefficients both at external and at internal surfaces
- Analyze and select heat exchangers

#### COMPETENCES

- Apply the acquired knowledge and skills to describe, model and solve problems in process engineering projects
- Communicate problems and solutions to people without thorough knowledge of the subject

#### TYPE OF INSTRUCTION

- Lectures and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Thermodynamic, Heat Transfer and Fluid Mechanics
Type of exam	Written 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	Termodynamik, varmetransmission og strømningsslære
Module code	K-KT-B5-5
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Matthias Mandø</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# MATHEMATICAL MODELING AND NUMERICAL METHODS

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in the modules Linear Algebra and Calculus

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for basic modeling and analysis of certain ordinary and partial differential equations
- Account for basic analysis of the above ordinary and partial differential equations
- Account for basic concepts of numerical methods
- Explain numerically solving non-linear systems of equations, integrals, and ordinary and partial differential equations
- Account for the modeling and analysis of the above ordinary and partial differential equations

#### SKILLS

- Use extra- and interpolation techniques such as Taylor polynomials and Lagrange polynomials
- Use Laplace transforms to solve differential equations
- Apply vector analysis and integral principles for mathematical modeling
- Apply methods, analytical as well as numerical, to solve the above ordinary and partial differential equations
- Set up and use the correct numerical method for solving a variety of areas, such as finding the zero point, integration, interpolation, differential equations
- Set up and solve 1- and 2-dimensional heat equations by analytical and numerical methods
- Set up and solve 1- and 2-dimensional wave equations by analytical and numerical methods
- Set up and solve Poisson's and Laplace's equations by numerical methods
- Develop solutions of differential equations using systems of eigenfunctions
- Solve partial differential equations using Fourier series and the separation method

#### COMPETENCES

- Engage in a dialogue regarding the optimal choice of analytical and numerical solution methods for partial differential equations, and results from mathematical modeling in general
- Disseminate setup and results of solving certain partial differential equations to others, including colleagues, government agencies and others

#### TYPE OF INSTRUCTION

- Lectures and theoretical exercises

#### EXTENT AND EXPECTED WORKLOAD

150 hours



## EXAM

### EXAMS

Name of exam	Mathematical Modeling and Numerical Methods
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	Matematisk modellering og numeriske metoder
Module code	K-KT-B5-6
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Morten Grud Rasmussen</a>

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# DESIGN OF EXPERIMENTS

2019/2020

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in Applied Statistics

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Explain the establishment of experimental design with qualitative and quantitative factors
- Account for complete, partial and confounding 2k and 3k factorial experiments
- Explain incomplete block design and splitplot designs
- Explain how to perform control experiments, including the use of central points
- Account for orthogonal experimental design
- Describe methods of optimization of the experimental factors and minimizing noise factors
- Account for regression analysis (including step-wise regression) of the drop in data
- Explain response surface design

#### SKILLS

- Develop study plans with qualitative and quantitative factors
- Perform control experiments
- Optimize the experimental factors
- Minimize the noise factors
- Use multiple analysis of variance and regression analyzes, including the combined variance and regression analyzes
- Analyze experimental data and be able to evaluate the methods used, validity and usefulness
- Use statistical design of experiments in practice within the domain of quality / process optimization and to process the results by statistical methods on a computer

### TYPE OF INSTRUCTION

Lectures and theoretical exercises

### EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Design of Experiments
Type of exam	Oral exam Based on a prepared mini project
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	Statistisk forsøgsplanlægning
Module code	K-KT-B6-6
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Sergey Kucheryavskiy</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# PROCESS CONTROL, INSTRUMENTATION AND SAFETY

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in:

Mathematical Modeling and Numerical Methods

Fundamental Fluid Mechanics and Heat Transfer

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for diagrams and system interconnections
- Explain modeling of physical systems, determination of operating points and linearization
- Explain a system's dynamic and stationary behavior, including the effects of the type and order of the system, as well as poles and zero points and their impact on the response of the system
- Account for analysis by root curves and knowledge of controller design using root curves
- Account for a system's frequency response (open-loop and closed - loop)
- Account for stability analyses
- Describe design using frequency response techniques
- Explain analog implementation of controllers
- Describe measurement techniques and data collection using a PC
- Account for software for building/developing applications for data acquisition and control
- Account for the structure and operation of the measurement system including sensors, signal processing and monitoring system
- Explain the operation of classical sensors (pressure, temperature, position, velocity, acceleration and flow)
- Account for sampling, different connections and noise from measurements

#### SKILLS

- Analyze block diagrams on the basis of PI – charts
- Model and analyze basic dynamical systems, including electrical, mechanical and thermal systems and analogies between these
- Develop models of dynamic systems in the form of transfer functions
- Apply control theory to achieve performance criteria
- Analyze a system's response and stability using the classical methods
- Select appropriate regulators and predict/assess their impact
- Use standard software for data acquisition, control and regulation
- Connect classical sensors and conduct research with classical sensors for pressure, temperature, position, velocity, acceleration and flow
- Assess the quality of the measurements and apply appropriate processing on them
- Disseminate the problem, the used solution method and interpret the outcome

#### TYPE OF INSTRUCTION

Lectures and theoretical exercises

## EXTENT AND EXPECTED WORKLOAD

150 hours

## EXAM

### EXAMS

Name of exam	Process Control, Instrumentation and Safety
Type of exam	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	Procesregulering, instrumentering og sikkerhed
Module code	K-KT-B6-7
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Sergey Kucheryavskiy</a>

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# PROJEKTLEDELSE OG ØKONOMI

2019/2020

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne:

- Redegøre for økonomiske vilkår for bygge- og anlægsbranchen
- Redegøre for budgettering, bogføring og budgetanalyse
- Redegøre for drifts-, investerings- og finansieringsmæssige kalkuler
- Redegøre for generelle projektledelsesmodeller og entreprenørskab
- Redegøre for grundlæggende projektplanlægningsværktøjer såsom tids- og ressourceplaner
- Redegøre for generelle organisations-, motivations-, kommunikations- og entreprenørskabsteorier
- Redegøre for arbejdsmiljø, sikkerhed og sundhed på byggeprojekter

#### FÆRDIGHEDER

- Anvende sædvanlige metoder til kalkulation af omkostninger i produktionsvirksomheder
- Anvende sædvanlige metoder til vurdering af investerings fordelagtighed samt til finansieringen af disse aktiviteter
- Forklare almindelige hændelsers bogmæssige posteringer
- Analysere regnskaber og på grundlag heraf vurdere den økonomiske situation
- Argumentere for sædvanlige modeller for motivation, kommunikation og ledelse og anvende modellerne på mindre komplekse cases
- Forklare traditionelle modeller for organisering af bygge- og anlægsprojekter samt mere moderne samarbejdsformer i sådanne projekter
- Udforme relevante tids- og ressourceplaner ud fra principperne bag lean construction
- Forklare begreber og metoder der bruges i ledelse af arbejdsmiljøarbejdet på en byggeplads
- Vurdere konkrete cases med henblik på deres anvendelse af konkrete arbejdsmiljømæssige redskaber

#### KOMPETENCER

- Redegøre for projektaktiviteters indvirkning på de økonomiske posteringer samt de styringsmæssige opgaver i projektledelsen
- Redegøre for det økonomiske og ledelsesmæssige rationale i at arbejde aktivt med arbejdsmiljø

#### UNDERVISNINGSFORM

Forelæsninger og teoretiske øvelser

#### OMFANG OG FORVENTET ARBEJDSINDSAT

150 timer

#### EKSAMEN

#### PRØVER

Prøvens navn	Projektledelse og økonomi
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	Project Management and Economics
Modulkode	K-KT-D6-3
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Morten Enggrob Simonsen</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# DIPLOMINGENIØRPRAKTIK

**2019/2020**

## FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Praktikken bygger videre på viden opnået i alle moduler til og med 5. semester

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Studerende, der gennemfører modulet, skal kunne:

- Redegøre for en virksomheds organisation og arbejde set ud fra en ingeniørmæssig synsvinkel
- Redegøre for sammenhængen mellem teori på uddannelsen og praksis

#### FÆRDIGHEDER

- Analysere om professionen har nye faglige behov der bør/kan varetages af uddannelsen
- Vurdere om læringsmålene for praktikken er blevet opfyldt

#### KOMPETENCER

- Analysere det faglige, arbejdsmæssige som det sociale udbytte af praktikopholdet
- Håndtere udviklingsorienterede situationer i studie- eller arbejdssammenhænge

#### UNDERVISNINGSFORM

Praktikken afvikles i sidste del af 6. semester og første del af 7. semester og følger retningslinjerne angivet i "SES-procedure for praktik" og "Retningslinjer for diplomingeniørpraktik", tillæg til fællesbestemmelserne. Det konkrete tidspunkt for opstart af praktikken meddeles særskilt

#### OMFANG OG FORVENTET ARBEJDSINDSAT

900 timer

## EKSAMEN

### PRØVER

Prøvens navn	Diplomingeniørpraktik
Prøveform	Mundtlig pba. projekt Prøven er på baggrund af skriftlig praktikrapport, dagbogen samt udtalelsen fra praktik-vejlederen
ECTS	30
Bedømmelsesform	Bestået/ikke bestået
Censur	Ekstern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning



## FAKTA OM MODULET

Engelsk titel	Internship for Bachelors of Engineering
Modulkode	K-KT-D6-5
Modultype	Projekt
Semester	Forår
ECTS	30
Undervisningssprog	Dansk
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Morten Enggrob Simonsen</a>
Censornorm	C

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# BACHELORPROJEKT I KEMI OG BIOTEKNOLOGI

## 2019/2020

### MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

#### LÆRINGSMÅL

##### VIDEN

Studerende, der gennemfører modulet, skal kunne

- Redegøre for udviklingsbaseret viden om faglig praksis og anvende teorier og metoder inden for kemi og bioteknologi

##### FÆRDIGHEDER

- Opbygge en projektrapport efter fagområdets normer, inddrage relevant litteratur, benytte korrekt fagsprog og formidle projektets problemstilling og resultater skriftligt, grafisk og mundtligt på en sammenhængende måde
- Begrunde valg af litteratur, metoder, modeller og andre redskaber benyttet i projektarbejdet samt vurdere projektets problemstilling og resultater i relevant faglig, samfundsmæssig og teoretisk kontekst samt i relation til faglitteraturen

##### KOMPETENCER

- Varetage planlægning, gennemførelse og styring af et projekt og håndtere komplekse og udviklingsorienterede opgaver under projektarbejdet og selvstændigt bidrage til projektgruppens arbejde og resultater
- Identificere egne læringsbehov for fortsat udvikling og videreuddannelse indenfor fagområdet

##### UNDERVISNINGSFORM

- Projektarbejde

##### OMFANG OG FORVENTET ARBEJDSINDSAT

450 timer

### EKSAMEN

#### PRØVER

Prøvens navn	Bachelorprojekt i kemi og bioteknologi
Prøveform	Mundtlig pba. projekt
ECTS	15
Bedømmelsesform	7-trins-skala
Censur	Ekstern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

### FAKTA OM MODULET

Engelsk titel	BSc Project in Chemical Engineering and Biotechnology
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Modulkode	K-KT-D7-5
Modultype	Projekt
Varighed	1 semester
Semester	Efterår
ECTS	15
Undervisningsprog	Dansk
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Morten Enggrob Simonsen</a>
Censornorm	C

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# MATERIALETEKNOLOGI

**2019/2020**

## FORUDSÆTNINGER/ANBEFALEDE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

The module adds to the knowledge obtained in:

Chemical and Bio Industrial Products II

Fundamental Chemical Engineering and Thermodynamics

Methods in Quantitative Chemical Analysis

Applied Statistics

## MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

### LÆRINGSMÅL

#### VIDEN

Students who have passed the module should be able to

- Account for the fundamental structure and physical/chemical properties of materials
- Account for the production and application of materials
- Describe relevant methods for analysis and testing of materials

#### FÆRDIGHEDER

- Select relevant analytical methods and approaches for a given problem
- Conduct a series of experiments to gain information about key parameters
- Evaluate results from experiments using statistical methods
- Select materials to improve either a process or product
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of methods, models and other tools used in the project and assess the problem of the project and results in relevant professional contexts

#### KOMPETENCER

- Interpret and evaluate knowledge about materials
- Evaluate results from experimental work and their applicability to a given problem
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### UNDERVISNINGSFORM

Project work

Access to perform laboratory experiments requires participation in laboratory safety instructions

## OMFANG OG FORVENTET ARBEJDSINDSAT

450 timer

## EKSAMEN

### PRØVER

Prøvens navn	Materialeteknologi
Prøveform	Mundtlig pba. projekt
ECTS	15
Bedømmelsesform	7-trins-skala
Censur	Ekstern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

## FAKTA OM MODULET

Engelsk titel	Material Science
Modulkode	K-KT-B4-13
Modultype	Projekt
Varighed	1 semester
Semester	Forår
ECTS	15
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	<a href="#">Morten Enggrob Simonsen</a>

## ORGANISATION

Studienævn	Studienævn for Kemi, Miljø og Bioteknologi
Institut	Institut for Kemi og Biovidenskab
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

# APPLIED MICROBIOLOGY

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in:

Chemical and Bio Industrial Products II

Chemical Analysis of Homogeneous Analysis

Methods in Quantitative Chemical Analysis

Applied Statistics

Microbial Biotechnology (in parallel)

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for basic microbiology
- Account for basic security in relation to the handling of microorganisms and enzymes
- Describe reactor types that are relevant for Technical Microbiology, configurations thereof as well as their advantages and limitations
- Account for scale-up of microbiological processes including physical conditions and limitations
- Describe sterilization procedures and decimation time for microorganisms

#### SKILLS

- Demonstrate basic skills in practical methods for the characterization of microorganisms, substrates and products
- Select suitable microorganisms or enzymes to a specific technical problem
- Set up and solve relevant mass and energy balances for microbiological processes at laboratory scale and in technical scale
- Describe the necessary safety measures at all scale levels
- Account for proper waste management at all scale levels
- Account for suitable analytical methods for monitoring the microbiological process
- Construct an experimental setup equipped with appropriate data collection
- Analyze and interpret data from a fermentation process based on knowledge of the microorganism used
- Report data from the technical microbiological studies using proper statistical computing
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of methods, models and other tools used in the project and assess the problem of the project and results in relevant professional contexts

#### COMPETENCES

- Provide technical microbiological knowledge to a broad range of people with different professional backgrounds
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results

- Identify own learning needs for continued development and education in the field of study

## TYPE OF INSTRUCTION

Project work

Access to perform laboratory experiments requires participation in laboratory safety instructions

## EXTENT AND EXPECTED WORKLOAD

450 hours

## EXAM

### EXAMS

Name of exam	Applied Microbiology
Type of exam	Oral exam based on a project
ECTS	15
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	Teknisk Mikrobiologi
Module code	K-KT-B4-18
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Jens Laurids Sørensen</a>
Time allocation for external examiners	B

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# PETROCHEMICAL SEPARATION PROCESSES

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in:

Chemical and Bio Industrial Products II

Fundamental Chemical Engineering and Thermodynamics

Methods in Quantitative Chemical Analysis

Applied Statistics

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Describe the fundamental separation technologies used in production of oil and gas
- Account for the fundamental aspects of oil and gas production
- Account for fundamental types of calculations related to the separation of oil and gas
- Explain fundamental knowledge thermodynamics related to oil and gas separation

#### SKILLS

- Perform relevant calculations relating to oil and gas separation
- Design a separation train for a given production
- Evaluate which types of material are appropriate for the construction of the separation units
- Set specifications for a unit design based on the process in question
- Select an appropriate separation process for a given process
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of methods, models and other tools used in the project and assess the problem of the project and results in relevant professional contexts

#### COMPETENCES

- Evaluate the effectiveness and applicability of different separation methods in oil and gas technology
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### TYPE OF INSTRUCTION

Project work

Access to perform laboratory experiments requires participation in laboratory safety instructions



## EXTENT AND EXPECTED WORKLOAD

450 hours

## EXAM

### EXAMS

Name of exam	Petrochemical Separation Processes
Type of exam	Oral exam based on a project
ECTS	15
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	Petrokemiske separationsprocesser
Module code	K-KT-B4-19
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Rudi P. Nielsen</a>
Time allocation for external examiners	B

## ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# CHEMICAL PROCESS ENGINEERING

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in Chemical and Bio Industrial Products II

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Describe the industrial or application context, in which the project work is included in, or may affect
- Describe general aspects of process engineering
- Explain the main unit operations in the process relating to the project work

#### SKILLS

- Determine which unit operation or reactor type is suitable in a given case
- Set specifications for process equipment for a given chemical process
- Analyze, model or size a selected process unit
- Perform relevant calculations for a given process
- Set up mass and energy balances for a given process
- Evaluate the effect of changing parameters for a given process
- Evaluate the potential of the project for further development, assessing and incorporating relevant economic factors
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of literature, methods, models and other tools used in the project and assess the problem of the project and results in relevant professional and social contexts and in relation to literature

#### COMPETENCES

- Propose relevant laboratory experiments to allow for better modelling of a process
- Evaluate if changes to a given process could be beneficial
- Propose a course of action regarding a given process
- Evaluate the quality of experimental data obtained and their applicability to a model of a given process
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### TYPE OF INSTRUCTION

Project work

#### EXTENT AND EXPECTED WORKLOAD

450 hours

## EXAM

### EXAMS

Name of exam	Chemical Process Engineering
Type of exam	Oral exam based on a project
ECTS	15
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	Kemisk processteknologi
Module code	K-KT-B5-14
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Rudi P. Nielsen</a>
Time allocation for external examiners	B

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# BIOPROCESS ENGINEERING

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in: Chemical and Bio Industrial Products, Microbial Biotechnology II, Chemical Thermodynamics and Separation Processes and Chemical Reaction Engineering is Followed Simultaneously

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Describe the industrial or application context, in which the project work is included in, or may affect
- Account for general aspects of process engineering
- Describe the main unit operations in the process relating to the project work

#### SKILLS

- Determine which unit operation or reactor type is suitable in a given case
- Set specifications for process equipment for a given chemical process
- Analyze, model or size a selected process unit
- Perform relevant calculations for a given process
- Set up mass and energy balances for a given process
- Evaluate the effect of changing parameters for a given process
- Evaluate the potential of the project for further development, assessing and incorporating relevant economic factors
- Propose relevant laboratory experiments to allow for better modelling of a process
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of literature, methods, models and other tools used in the project and assess the problem of the project and results in relevant professional and social contexts and in relation to literature

#### COMPETENCES

- Evaluate if changes to a given process could be beneficial
- Propose a course of action regarding a given process
- Evaluate the quality of experimental data obtained and their applicability to a model of a given process
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### TYPE OF INSTRUCTION

- Project work

#### EXTENT AND EXPECTED WORKLOAD

450 hours

## EXAM

### EXAMS

Name of exam	Bioprocess Engineering
Type of exam	Oral exam based on a project
ECTS	15
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	Bioprocesteknologi
Module code	K-KT-B5-15
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Rudi P. Nielsen</a>
Time allocation for external examiners	B

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science

# REFINERY PRODUCTS AND PROCESSES

**2019/2020**

## PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in Chemical and Bio Industrial Products II

## CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

### LEARNING OBJECTIVES

#### KNOWLEDGE

Students who have passed the module should be able to

- Account for crude oil production
- Account for the composition of crude oil
- Describe the general structure of an oil refinery
- Explain the main refinery processes such as distillation, cracking and desulphurization
- Describe a given refinery process

#### SKILLS

- Perform relevant calculations for a given refinery process
- Set up mass and energy balances for a given refinery process
- Evaluate the effect of changing parameters for a given refinery process
- Evaluate the potential of the project for further development, assessing and incorporating relevant economic factors
- Propose relevant laboratory experiments to allow for better modelling of a process
- Write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and communicate the problem and results in writing, graphically and orally in a coherent way
- Justify the choice of literature, methods, models and other tools used in the project and assess the problem of the project and results in relevant professional and social contexts and in relation to literature

#### COMPETENCES

- Evaluate if changes to a given process could be beneficial
- Propose a course of action regarding a given process
- Evaluate the quality of experimental data obtained and their applicability to a model of a given refinery process
- Handle the planning, implementation and management of a project and handle complex and development-oriented tasks during the project work and contribute to the project group's work and results
- Identify own learning needs for continued development and education in the field of study

#### TYPE OF INSTRUCTION

- Project work

#### EXTENT AND EXPECTED WORKLOAD

450 hours

## EXAM

### EXAMS

Name of exam	Refinery Products and Processes
Type of exam	Oral exam based on a project
ECTS	15
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	Raffinaderiprodukter og processer
Module code	K-KT-B5-16
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	<a href="#">Rudi P. Nielsen</a>
Time allocation for external examiners	B

### ORGANISATION

Study Board	Study Board of Biotechnology, Chemistry and Environmental Engineering
Department	Department of Chemistry and Bioscience
Faculty	Faculty of Engineering and Science