



AALBORG UNIVERSITET

DIPLOMINGENIØR I KEMI OG BIOTEKNOLOGI, 2020 (ESBJERG)

DIPLOMINGENIØR
ESBJERG

MODULER SOM INDGÅR I STUDIEORDNINGEN

INDHOLDSFORTEGNELSE

Kemiske og bioindustrielle produkter II 2022/2023	3
Kemiske og bioindustrielle produkter I 2022/2023	5
Calculus 2022/2023	7
Problembaseret læring 2022/2023	9
Almen kemi 2022/2023	11
Kemiske reaktioner i naturlige og tekniske systemer 2022/2023	13
Biologisk aktive molekyler – introduktion til cellebiologi og biologisk kemi 2022/2023	15
Grundlæggende kemisk procesteknik og termodynamik 2022/2023	17
Lineær algebra 2022/2023	19
Analysis of Chemical Systems 2022/2023	21
Methods in Quantitative Chemical Analysis 2022/2023	23
Inorganic and Organic Chemistry 2022/2023	25
Applied Statistics 2022/2023	27
Chemical Thermodynamics and Separation Process Engineering 2022/2023	29
Microbial Biotechnology 2022/2023	31
Material Science and Material Selection 2022/2023	33
Chemical Reaction Engineering 2022/2023	35
Varmetransmission og strømningsmekanik 2022/2023	37
Mathematical Modeling and Numerical Methods 2022/2023	39
Design of Experiments 2022/2023	41
Process Control, Instrumentation and Safety 2022/2023	43
Projektledelse og økonomi 2022/2023	45
Diplomingeniørpraktik 2022/2023	47
Bachelorprojekt 2022/2023	49
Material Science 2022/2023	51
Applied Microbiology 2022/2023	53
Petrochemical Separation Processes 2022/2023	55
Chemical Process Engineering 2022/2023	57
Bioprocess Engineering 2022/2023	59
Refinery Products and Processes 2022/2023	61

KEMISKE OG BIOINDUSTRIELLE PRODUKTER II

2022/2023

ANBEFALEDE FAGLIGE 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	7-trins-skala
Censur	Intern prøve

Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning
---------------------	---

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
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	Muff

ORGANISATION

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

KEMISKE OG BIOINDUSTRIELLE PRODUKTER I

2022/2023

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	Bestået/ikke bestået
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	Muff

ORGANISATION

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

CALCULUS

2022/2023

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

- Reelle funktioner af to og flere variable – definitioner, resultater og teknikker vedrørende partielle afledte
- Krumning og torsion karakteriserer rumkurver.
- Integration i plan og rum mht. forskellige koordinatsystemer herunder sammenhæng mellem disse.
- Struktur af løsningsmængden til forskellige typer første- og andenordens differentialligninger.

FÆRDIGHEDER

- Differentiation af funktioner af flere variable (herunder sammensatte funktioner) samt en geometrisk forståelse heraf
- Ekstrema for funktioner af to og tre variable.
- Maksima og minima for funktioner af to variable.
- Bestemme krumning og torsion, buelængde, hastighed, acceleration og give geometrisk fortolkning heraf.
- Opstille og udregne simple plan- og rumintegraler i forskellige koordinatsystemer.
- Løsning og plot af forskellige typer første- og andenordens differentialligninger.

KOMPETENCER

Kan anvende metoder og begreber fra calculus, herunder rumkurver, integration og differentialligninger på givne faglige problemstillinger.

UNDERVISNINGSFORM

Forelæsninger, opgaveregning, videoer, quiz, digitaliseret selvstudium, fagrettede workshops.

OMFANG OG FORVENTET ARBEJDSINDSAT

Kursusmodulets omfang er 5 ECTS svarende til 150 timers studieindsats.

EKSAMEN

PRØVER

Prøvens navn	Calculus
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	Calculus
Modulkode	MAT1CALC1235
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Aalborg, Campus Esbjerg, Campus København
Modulansvarlig	Fajstrup

ORGANISATION

Studienævn	Studienævn for Matematiske Fag
Institut	Institut for Matematiske Fag
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

PROBLEMBASERET LÆRING

2022/2023

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

- centrale tilgange, begreber og teknikker i problembaseret læring
- forskellige problemtyper, projektyper og deres indbyrdes relationer
- videnskabsteoretiske positioner i problembaseret projektarbejde

FÆRDIGHEDER

- definere problembaseret læring med udgangspunkt i teori og egne erfaringer
- planlægge og styre et problembaseret projektarbejde under hensynstagen til den givne problemtype, projektets længde og gruppens sammensætning
- identificere, analysere og formulere en åben og kompleks problemstilling under hensynstagen til de menneskelige og samfundsmæssige sammenhænge i hvilke problemet indgår
- udpege relevante fokusområder, begreber og metoder til åben og bæredygtig problemløsning af komplekse problemer
- diskutere metodiske konsekvenser af forskellige videnskabsteoretiske positioner
- analysere, sammenstille og vurdere processerne i arbejdet med forskellige problemtyper
- analysere og vurdere gruppeprocesserne i det problemorienterede projektarbejde, herunder gruppens planlægning, monitorering og udvikling af gruppearbejdet

KOMPETENCER

- udvikle en studiepraksis, der er tilpasset et problembaseret, projektorganiseret og digitaliseret læringsmiljø
- udpege, afprøve og evaluere relevante teknikker og tilgange til at forbedre et problembaseret projektarbejde
- overføre erfaringer fra problemaserede projekter til handlingsanvisninger for lignende projekter
- vurdere egen progression i PBL på et erfaringsbaseret og læringsteoretisk grundlag

UNDERVISNINGSFORM

Se § 17: Uddannelsens indhold og tilrettelæggelse

EKSAMEN

PRØVER

Prøvens navn	Problembaseret læring
Prøveform	Skriftlig
ECTS	5
Bedømmelsesform	Bestået/ikke bestået
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Problem Based Learning
Modulkode	TECHENGPBL20
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Aalborg, Campus København, Campus Esbjerg
Modulansvarlig	Holgaard

ORGANISATION

Studienævn	Studienævn for Planlægning og Landinspektøruddannelsen
Institut	Institut for Planlægning
Fakultet	Det Teknisk Fakultet for IT og Design

ALMEN KEMI

2022/2023

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 cellepotential
- 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

FORUDSÆTNING FOR INDSTILLING TIL PRØVEN

- Godkendt aktiv deltagelse i undervisningen er forudsætning for deltagelse i den ordinære prøve
- Godkendte opgaver er forudsætning for deltagelse i reeksamen

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-B1-1
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	Muff

ORGANISATION

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

KEMISKE REAKTIONER I NATURLIGE OG TEKNISKE SYSTEMER

2022/2023

ANBEFALEDE FAGLIGE 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 udførsel 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	Muff
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

2022/2023

ANBEFALEDE FAGLIGE 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 membraners 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 spillet 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

FORUDSÆTNING FOR INDSTILLING TIL PRØVEN

- Godkendt aktiv deltagelse i undervisningen er forudsætning for deltagelse i den ordinære prøve
- Godkendte opgaver er forudsætning for deltagelse i reeksamen

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

FAKTA OM MODULET

Engelsk titel	Biological Active Molecules – Introduction to Cell Biology and Biological Chemistry
Modulkode	K-KT-D2-1
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	Sørensen

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

2022/2023

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

Studerende, der gennemfører modulet, skal kunne

- 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, fasebalance for rene stoffer samt fase diagrammer
- redegøre for kemisk potentiale og termodynamisk ligevægt for kemiske reaktioner

FÆRDIGHEDER

- læse procesdiagrammer
- foretage en relevant afgrænsning og/eller opdeling af en given teknisk, kemisk eller biologisk proces og udfærdige et blok- eller procesdiagram 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 fase diagrammer 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 procesteknik 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 og engelsk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	Maschietti

ORGANISATION

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

LINEÆR ALGEBRA

2022/2023

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

- Vektorer, matricer og lineære ligningssystemer. Sammenhængen mellem løsning af lineære ligningssystemer, associerede matricer og operationer på disse
- Lineær uafhængighed og dimension. Egenverdier og egenvektorer
- Sammenhængen mellem egenskab for en matrix og dens reducerede
- Lineær programmerings muligheder og begrænsninger.
- Mindste kvadraters metode og forbindelsen til ortogonal projektion. Ortogonale og symmetriske matricer

FÆRDIGHEDER

- Matrix-vektorprodukt, produkt og sum af matricer. Rækkeoperationer. Gausselimination
- Egenverdier og egenrum
- Løsning af lineært ligningssystem på vektorform
- Basis for underrum hørende til en matrix'
- Simplexmetoden. Omskrivning til standardform.
- Mindste kvadraters metode på et datasæt

KOMPETENCER

Kan anvende metoder og begreber fra lineær algebra, herunder lineær programmering og ortogonale projektioner på givne faglige problemstillinger.

UNDERVISNINGSFORM

Forelæsninger, opgaveregning, videoer, quiz, digitaliseret selvstudium, fagrettede workshops.

OMFANG OG FORVENTET ARBEJDSINDSAT

Kursusmodulets omfang er 5 ECTS svarende til 150 timers studieindsats.

EKSAMEN

PRØVER

Prøvens navn	Lineær algebra
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	Linear Algebra
Modulkode	MAT2LIAL1257
Modultype	Kursus
Varighed	1 semester
Semester	Forår
ECTS	5
Undervisningssprog	Dansk og engelsk
Tomplads	Ja
Undervisningssted	Campus Aalborg, Campus Esbjerg
Modulansvarlig	Fajstrup

ORGANISATION

Studienævn	Studienævn for Matematiske Fag
Institut	Institut for Matematiske Fag
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

ANALYSIS OF CHEMICAL SYSTEMS

2022/2023

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 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 reactions
- perform relevant statistical calculations and select 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 assess the problem of the project and results in relevant professional contexts

COMPETENCES

- select the best possible analytical equipment for chemical analysis of a given product or 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	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Simonsen
Time allocation for external examiners	B

ORGANISATION

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

METHODS IN QUANTITATIVE CHEMICAL ANALYSIS

2022/2023

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	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	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	Simonsen

ORGANISATION

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

INORGANIC AND ORGANIC CHEMISTRY

2022/2023

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, carbocation, 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	Muff

ORGANISATION

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

APPLIED STATISTICS

2022/2023

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 and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Svante Eriksen

ORGANISATION

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

CHEMICAL THERMODYNAMICS AND SEPARATION PROCESS ENGINEERING

2022/2023

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	Rudi P. Nielsen

ORGANISATION

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

MICROBIAL BIOTECHNOLOGY

2022/2023

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	Sørensen

ORGANISATION

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

MATERIAL SCIENCE AND MATERIAL SELECTION

2022/2023

RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module adds to the knowledge obtained in:

Linear Algebra

Calculus

Fundamental Chemical Engineering and Thermodynamics or Introduction to Mechanics 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	Simonsen

ORGANISATION

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

CHEMICAL REACTION ENGINEERING

2022/2023

RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge gained in 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
- test rate equations from kinetic data
- 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	Maschietti

ORGANISATION

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

VARMETRANSMISSION OG STRØMNINGSMEKANIK

2022/2023

ANBEFALEDE FAGLIGE FORUDSÆTNINGER FOR AT DELTAGE I MODULET

Modulet bygger på viden opnået i modulet "Grundlæggende mekanik og termodynamik".

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

Studerende der gennemfører modulet:

- Skal have viden om maskinteknisk termodynamik, grundlæggende strømningslære, konvektiv varmeovergang, varmeledning udtrykt ved termisk modstandsnetværk og laboratoriesikkerhed.
- Skal kunne forstå
 - Grundlæggende maskinteknisk termodynamik:
 - Grundlæggende strømningslære
 - Grundlæggende varmetransmission
 - Sikkerhed ved arbejde i laboratoriet

FÆRDIGHEDER

Studerende der gennemfører modulet:

- Skal kunne anvende maskinteknisk termodynamik til løsning af praktiske problemstillinger i ingeniørmæssige sammenhænge.
- Skal kunne anvende grundlæggende strømningslære til at løse strømningsrelaterede problemstillinger omkring strømninger i større rørsystemer med forskellige komponenter, såsom pumper, turbiner, ventiler, bøjninger og dyser.
- Skal kunne anvende simpel strømningslære til at analysere de fluidmekaniske påvirkninger på objekter omgivet af en fluid i bevægelse.
- Skal kunne beregne varmestrøm i termiske modstandsnetværk.
- Skal kunne beregne varmeovergang ved såvel eksterne som interne strømninger.
- Skal kunne vurdere sikkerheden ved arbejdet i laboratorier.

KOMPETENCER

Studerende der gennemfører modulet:

- Skal have evnen til at anvende fagområdet i tværfagligt samarbejde med andre fagområder.
- Skal have evnen til at anvende viden omkring sikkerhed i laboratoriet på en måde, så arbejdet med opstillinger udføres sikkerheds og sundhedsmæssigt korrekt.

UNDERVISNINGSFORM

Undervisningen tilrettelægges i henhold til de generelle undervisningsformer for uddannelsen, jf. § 17/18.

OMFANG OG FORVENTET ARBEJDSINDSAT

Kursusmodulets omfang er 5 ECTS svarende til 150 timers studieindsats.

EKSAMEN

PRØVER

Prøvens navn	Varmetransmission og strømningsmekanik
Prøveform	Skriftlig og mundtlig Der udarbejdes et miniprojekt, hvor problemstillingen forankres i den enkelte studerendes studieprogram. I miniprojektet analyseres en praktisk problemstilling, og resultatet præsenteres med afsæt i de indlærte færdigheder. Projektet dokumenteres med en kort rapport (max 10 sider) samt en præsentation på max 10 minutter.
ECTS	5
Bedømmelsesform	7-trins-skala
Censur	Intern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Heat Transfer and Fluid Mechanics
Modulkode	B-MT-D5-11
Modultype	Kursus
Varighed	1 semester
Semester	Efterår
ECTS	5
Undervisningssprog	Dansk og engelsk
Undervisningssted	Campus Esbjerg
Modulansvarlig	Lars Damkilde , Søren Heide Lambertsen

ORGANISATION

Studienævn	Studienævn for Byggeri, Energi, Elektronik og Maskin i Esbjerg
Institut	Institut for Energi
Fakultet	Det Ingeniør- og Naturvidenskabelige Fakultet

MATHEMATICAL MODELING AND NUMERICAL METHODS

2022/2023

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	Rasmussen

ORGANISATION

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

DESIGN OF EXPERIMENTS

2022/2023

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	Written or 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	Sergey Kucheryavskiy

ORGANISATION

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

PROCESS CONTROL, INSTRUMENTATION AND SAFETY

2022/2023

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	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	Procesregulering, instrumentering og sikkerhed
Module code	K-KT-B6-7A
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	Rudi P. Nielsen

ORGANISATION

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

PROJEKTLEDELSE OG ØKONOMI

2022/2023

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	Simonsen

ORGANISATION

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

DIPLOMINGENIØRPRAKTIK

2022/2023

FORUDSÆTNINGER FOR DELTAGELSE I MODULET

Bestået 1.-5. semester

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

Målsætning for ingeniørpraktikken er at forberede den studerende til en karriere som ingeniør. Praktikforløbet har flg. sigte

- at give den studerende indblik i ingeniørarbejde i praksis
- at give den studerende erfaring i at erkende praktiske problemer i virksomheden
- at gøre den studerende bekendt med de empiriske metoder, der anvendes inden for arbejdsområdet
- at give den studerende indsigt i ledelsesmæssige funktioner

Praktikken afvikles over 20 uger af 37 arbejdstimer, ekskl. ferie,. Såfremt praktikopholdet afvikles i udlandet, er praktikopholdet af 20 ugers varighed med det antal ugentlige arbejdstimer, der er gældende i det pågældende land.

Den studerende skal selv skaffe sig en praktikplads. Praktikkoordinatoren eller andre kan evt. være behjælpelig med kontakter til relevante virksomheder.

Praktikopholdet godkendes af universitetet, og der udarbejdes en praktikaftale mellem den studerende og virksomheden. Virksomheden udpeger en praktikansvarlig, som den studerende refererer til i virksomheden.

Hvis udviklingen på praktikstedet nødvendiggør ændringer i det godkendte praktikophold, skal disse godkendes af praktikkoordinatoren.

Under praktikopholdet skal den studerende føre dagbog over det udførte arbejde.

Praktikrapporten skal udarbejdes efter samme retningslinier, som anvendes ved udarbejdelse af projektrapporter, og skal indeholde:

- Beskrivelse af virksomheden og dens arbejdsområder
- Oversigt over de arbejdsområder, den studerende har været involveret i
- Teknisk gennemgang og beskrivelse af mindst ét af arbejdsområderne
- Analyse af praktikopholdets udbytte såvel fagligt, arbejdsmæssigt og socialt

LÆRINGSMÅL

VIDEN

Studerende, der gennemfører modulet, skal kunne

- redegøre for de emner, der er arbejdet med under praktikopholdet, herunder hvilke metoder, der er anvendt, og resultater, der er opnået
- redegøre for praktikstedets organisatoriske og ledelsesmæssige forhold

KOMPETENCER

- begå sig på en ingeniørarbejdsplads
- relatere de anvendte metoder til de teoretiske og/eller empiriske principper og metoder, der er anvendt i studiets forudgående kurser og projektarbejder

UNDERVISNINGSFORM

Praktik

OMFANG OG FORVENTET ARBEJDSINDSAT

900 timer

EKSAMEN

FORUDSÆTNING FOR INDSTILLING TIL PRØVEN

- Godkendt PBL kompetenceprofil er en forudsætning for deltagelse i eksamen

PRØVER

Prøvens navn	Diplomingeniørpraktik
Prøveform	Skriftlig Skriftlig rapport
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-D6-5A
Modultype	Projekt
Semester	Praktikperiode: 1. maj - 1. oktober
ECTS	30
Undervisningssprog	Dansk
Tomplads	Ja
Undervisningssted	Campus Esbjerg
Modulansvarlig	Simonsen
Censornorm	A

ORGANISATION

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

BACHELORPROJEKT

2022/2023

MODULETS INDHOLD, FORLØB OG PÆDAGOGIK

LÆRINGSMÅL

VIDEN

Studerende, der har gennemført modulet, skal kunne

- redegøre for teori, metoder og praksis inden for uddannelsens kompetenceprofil

FÆRDIGHEDER

- formulere relevante problemer, som kan danne grundlag for den problembaserede tilgang til projektet
- opbygge og udarbejde en projektrapport efter fagområdets normer, inddrage relevant litteratur, benytte korrekt fagsprog samt formulere og formidle projektets problemstilling og resultater skriftligt, grafisk og mundtligt på en fagligt begrundet og sammenhængende måde
- begrunde valg af litteratur, metoder, modeller og andre redskaber benyttet i projektarbejdet samt vurdere projektets problemstilling og resultater i relevant faglig, samfundsmæssig, økonomisk og teoretisk kontekst samt i relation til faglitteraturen

KOMPETENCER

- varetage planlægning, gennemførelse og styring af et problemorienteret 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 arbejdstimer

EKSAMEN

PRØVER

Prøvens navn	Bachelorprojekt
Prøveform	Speciale/afgangsprojekt
ECTS	15
Bedømmelsesform	7-trins-skala
Censur	Ekstern prøve
Vurderingskriterier	Vurderingskriterierne er angivet i Universitetets eksamensordning

FAKTA OM MODULET

Engelsk titel	Bachelor Project
Modulkode	K-KMB-B6-1
Modultype	Projekt
Varighed	1 semester
Semester	Forår
ECTS	15
Undervisningssprog	Dansk
Modulansvarlig	Pedersen
Censornorm	C

ORGANISATION

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

MATERIAL SCIENCE

2022/2023

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

- 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

SKILLS

- formulate relevant problems that can form the basis of the problem-based approach to the project
- 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 professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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	Material Science
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	Materialeteknologi
Module code	K-KT-B4-13A
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Simonsen
Time allocation for external examiners	B

ORGANISATION

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

APPLIED MICROBIOLOGY

2022/2023

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

- formulate relevant problems that can form the basis of the problem-based approach to the project
- 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 professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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-B4-18A
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Sørensen
Time allocation for external examiners	B

ORGANISATION

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

PETROCHEMICAL SEPARATION PROCESSES

2022/2023

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

- formulate relevant problems that can form the basis of the problem-based approach to the project
- 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 professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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-B4-19A
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Rudi P. Nielsen
Time allocation for external examiners	B

ORGANISATION

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

CHEMICAL PROCESS ENGINEERING

2022/2023

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

- formulate relevant problems that can form the basis of the problem-based approach to the project
- write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and formulate and communicate the problem and results in writing, graphically and orally in a professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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-B5-14A
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Rudi P. Nielsen
Time allocation for external examiners	B

ORGANISATION

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

BIOPROCESS ENGINEERING

2022/2023

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

- formulate relevant problems that can form the basis of the problem-based approach to the project
- write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and formulate and communicate the problem and results in writing, graphically and orally in a professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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-B5-15A
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Rudi P. Nielsen
Time allocation for external examiners	B

ORGANISATION

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

REFINERY PRODUCTS AND PROCESSES

2022/2023

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

- formulate relevant problems that can form the basis of the problem-based approach to the project
- write a project report following the standards of the field of study, include relevant literature, use the correct terminology, and formulate and communicate the problem and results in writing, graphically and orally in a professionally reasoned and 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

- handle the planning, implementation and management of a problem based 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-B5-16A
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Esbjerg
Responsible for the module	Rudi P. Nielsen
Time allocation for external examiners	B

ORGANISATION

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