AALBORG UNIVERSITET

CIVILINGENIØR, CAND.POLYT. I MATERIALETEKNOLOGI 2016

CIVILINGENIØR
AALBORG

MODULER SOM INDGÅR I STUDIEORDNINGEN

INDHOLDSFORTEGNELSE

METALLIC MATERIALS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained an in-depth understanding of theoretical and experimental methods in metallurgy within the specific area of topics covered by the project.
- Have attained an understanding for methods of analysis and experimental methods and their characteristics, applications, and limitations.

SKILLS

- Be able to describe and experimentally determine a likely phase and chemical composition for metallic alloys.
- Be able to demonstrate understanding of microstructure for metals and metal alloys.
- Be able to devise mechanical or heat treatments for a metal or an alloy, and be able to predict the outcome of applying such a treatment.
- Be able to give a critical evaluation of the methods applied for determining microstructure, chemical composition or mechanical and other properties.
- Be able to use correct terminology.
- Be able to compare theoretical and experimental results.

COMPETENCES

- Be able to set up a realistic hypothesis for the outcome of a process, obtaining a property or the like, within the field of metallurgy.
- Be able to devise an experimental method to falsify or validate a given hypothesis.
- Be able to use advanced experimental techniques within the field of metallurgy.
- Be able to apply the background theory and the insight obtained, in validation of material choice for a given application.

TYPE OF INSTRUCTION

The module is carried out as group-based problem-oriented project work. The group work is carried out as an independent work process in which the students themselves organize and coordinate their workload in collaboration with a supervisor. The project is carried out in groups with normally no more than 6 members.

EXTENT AND EXPECTED WORKLOAD

Since it is a 15 ECTS course module the expected workload is 450 hours for the student.

EXAM

EXAMS

Name of exam	Metallic Materials
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	Metalliske materialer
Module code	M-MAT-K1-1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

METALS AND ALLOYS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Be able to understand the fundamental chemical, physical and microstructural description of metals and alloys.
- Be able to understand the relation between microstructure and mechanical properties.

SKILLS

- Be able to describe and predict microstructures and microstructural changes for heat treatments and mechanical treatments.
- Be able to connect processing parameters to mechanical properties.
- Be able to understand different kinds of corrosion mechanisms, and their prevention.
- Be able to use concepts of electrochemistry in problems pertaining to corrosion and electro deposition.

COMPETENCES

- Be able to understand and apply knowledge and theory in choosing materials and specifying relevant mechanical, heat,and surface treatments for a given application.
- Be able to take environment, loading conditions, and other relevant consideration into account in choosing materials and treatments.
- Be able to understand and apply knowledge and theory in developing materials with specific mechanical, physical and chemical properties.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Metals and Alloys
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	Metaller og legeringer

Module code	M-MAT-K1-2
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Mikael Larsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

CONTINUUM MECHANICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Be able to understand central concepts, theories and methods in the theory of elasticity.
- Be able to describe spatial deformations with the use of theory of elasticity such that the geometrical, dynamical/statical and constitutive conditions are satisfied
- Be able to understand the concepts of non-linear elasticity, viscoelasticity and plasticity.

SKILLS

- Be able to account for the considerations necessary for applying the concepts, theories and methods of the theory of elasticity.
- Be able to use correct concepts, notation and symbols.
- Be able to use index notation and tensors in problems related to the theory of elasticity.

COMPETENCES

- Be able to use the theory of elasticity for determining displacements, strains, and stresses under different loading situations.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Continuum Mechanics
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	Kontinuummekanik
Module code	M-MAT-K1-3

Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

SOLID MECHANICS WITH MICROSTRUCTURE

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Be able to understand central concepts, theories and methods in the theory of elasticity.
- Be able to describe spatial deformations with the use of theory of elasticity such that the geometrical, dynamical/statical and constitutive conditions are satisfied
- Be able to understand the concepts of non-linear elasticity, viscoelasticity and plasticity.

SKILLS

- Be able to account for the considerations necessary for applying the concepts, theories and methods of the theory of elasticity.
- Be able to use correct concepts, notation and symbols.
- Be able to use index notation and tensors in problems related to the theory of elasticity.
- Be able to understand fundamental results pertaining to thermal stresses, inclusions, inhomogeneities, and dislocations.

COMPETENCES

- Be able to use the theory of elasticity for determining displacements, strains, and stresses under different loading situations.
- Be able to use results from elasticity theory in explaining material related problems on macro and micro structural levels.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Continuum Mechanics
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	Kontinuummekanik og mikromekanik
Module code	M-MAT-K1-4
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

FRACTURE MECHANICS AND FATIGUE

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained a comprehensive understanding of fracture mechanics.
- Have gained knowledge in applying classical methods in designing against fatigue fracture by studying notches and their effect, by studying strain-fatigue, and by analysing eigen-stress states.
- Have gained an understanding of how to apply fracture mechanics in the assessment of reliability of practical designs and machine elements.

SKILLS

- Be able to assess the stability of cracks using Griffith's and Irwin's fracture criteria, energy release rate, and toughness concepts
- Be able to apply linear elastic solutions for sharp cracks and obtain the stress intensity factor.
- Be able to assess mixed mode loading and apply crack growth direction hypotheses
- Be able to assess crack growth by fatigue, partial damage and load spectra.
- Be able to assess crack initiation, notches and their effect.
- Be able to determine life time and apply methods for improving the fatigue strength and life time of machine elements and welded details.

COMPETENCES

- Be able to understand and apply linear elastic concepts in assessing the stability of cracked structures under static and fatigue loading.
- Be able to distinguish between different fatigue regimes, i.e. elastic or plastic, and un-cracked or pre-cracked, and apply correct methodology to each case in relevant structures.
- Be able to determine the lifetime of welded components, and explain fatigue in welded components on the basis of fracture mechanical concepts.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Fracture Mechanics and Fatigue
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	Brudmekanik og udmattelse
Module code	M-DMS-K1-4
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen, Jens Henrik Andreasen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

POLYMERS AND POLYMER COMPOSITES

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 1st Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained a comprehensive understanding of polymers.

SKILLS

- Be able to choose a polymer/polymer composite for a given application
- Be able to specify a material system for a composite to a given application
- Be able to demonstrate understanding of microstructure for polymers and polymer based composites.
- Be able to give a critical evaluation of the methods applied for determining microstructure, chemical composition or mechanical and other properties.
- Be able to use correct terminology.
- Be able to compare theoretical and experimental results.

COMPETENCES

- Be able to devise experiments for documentation.
- Be able to set up a realistic hypothesis for the outcome of a process, obtaining a property, or the like, within the field of polymers and polymer based composites.
- Be able to devise an experimental method to falsify or validate a given hypothesis.
- Be able to use advanced experimental techniques within the field of polymers and polymer composites.
- Be able to apply the background theory and the insight obtained, for validation of the material choice for a given application.

TYPE OF INSTRUCTION

The module is carried out as group-based problem-oriented project work. The group work is carried out as an independent work process in which the students themselves organize and coordinate their workload in collaboration with a supervisor. The project is carried out in groups with normally no more than 6 members.

EXTENT AND EXPECTED WORKLOAD

Since it is a 15 ECTS course module the expected workload is 450 hours for the student.

EXAM

EXAMS

Name of exam	Polymers and Polymer Composites
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	Polymerer og polymer kompositter
Module code	M-MAT-K2-1
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

FUNDAMENTAL POLYMER CHEMISTRY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 1st Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Basic Principles: Molecular weight and polymer solutions,
- Chemical Structure and Polymer Properties
- Polymer Morphology
- Various polymerization processes
- Characterization of polymers, Polyethers, sulfides, and related polymers, Polyamides and related polymers, Heterocyclic polymers, Miscellaneous organic polymers, Inorganic and partially inorganic polymers, Natural Polymers

SKILLS

- Be able to grasp different polymerization principles
- Be able to understand synthetic routes of functional monomers

COMPETENCES

- Characterize macromolecules: from chemical structure to molecular weights and distributions
- Use advanced experimental techniques for documenting modifications to polymers

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Fundamental Polymer 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	Grundlæggende polymerkemi
Module code	M-MAT-K2-2
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Catalina-Gabriela Sanporean

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

POLYMER CHEMISTRY

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 1st Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Basic Principles: Molecular weight and polymer solutions,
- Chemical Structure and Polymer Properties
- Polymer Morphology
- Step-reaction and ring opening polymerization
- Free radical polymerization
- Ionic Polymerization and
- Vinyl polymerization with complex coordination catalysts
- Characterization of polymers, Polyethers, sulfides, and related polymers, Polyamides and related polymers, Heterocyclic polymers, Miscellaneous organic polymers, Inorganic and partially inorganic polymers, Natural Polymers

SKILLS

- Be able to grasp different polymerization principles
- Be able to understand synthetic routes of functional monomers
- Be able to Perform polymerization under various conditions
- Be able to modify polymer surfaces

COMPETENCES

- Characterize macromolecules: from chemical structure to molecular weights and distributions
- Use advanced experimental techniques for documenting modifications to polymers

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Polymer 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	Polymerkemi
Module code	M-MAT-K2-5
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Catalina-Gabriela Sanporean

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

SIMULATION AND MEASURING OF MATERIALS BEHAVIOR

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 1st Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Attain knowledge about describing and modelling the microstructure of materials.
- Be able to apply modelling techniques for simulation of material properties

SKILLS

- Be able to use different experimental techniques, such as Raman spectroscopy, dynamic mechanical analysis (DMA), thermo-mechanical analysis (TMA), differential scanning calorimetry (DSC) and Fourier transform infrared spectroscopy (FTIR).
- Be able to simulate selected test techniques or processes utilizing multiphysics software packages.

COMPETENCES

- Be able to combine measuring techniques for determining material behaviour, such that techniques for determining mechanical properties are used along with methods for describing microstructure and molecular and atomic structure.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Fundamental Polymer Chemistry
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Simulering og måling af materialeopførsel
Module code	M-MAT-K2-3
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

POLYMERS AND COMPOSITE MATERIALS

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 1st Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained an in-depth understanding of the overall topical area of polymers and composite materials including their properties, manufacturing, analysis and design.
- Be able to document understanding of following concepts and theories:
  - Applications of composites: past, present and future.
  - Fibers and polymer resin materials: Types and properties.
  - Manufacturing methods, their processing characteristics and influence on the mechanical properties of composites.
  - Laminae and laminates: Micro-mechanical models, modeling of the laminae, classical lamination theory (CLT).
  - Thermal effects.
- Microstructural Fracture and failure

SKILLS

- Be able to apply concepts, theories and methods for analysis and design of composite materials.
- Be able to characterize polymers and composite materials in terms of various experimental techniques.
- Be able to understand the relation between processing conditions and subsequent material properties.

COMPETENCES

- Be able to undertake development and product design using polymers and composite materials.
- Be able to develop procedures for production and verification of components made from polymer and composite materials.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 5 ECTS course module the expected workload is 150 hours for the student.

EXAM

EXAMS

Name of exam	Polymers and Composite Materials
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	Polymerer og kompositmaterialer
Module code	M-MAT-K2-4
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Erik Appel Jensen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

INDUSTRIAL DEVELOPMENT

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge obtained in 2nd Semester

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained knowledge and understanding of advanced materials.
- Be able to apply analytical, numerical and experimental methods in relation to verification of material performance.

SKILLS

- Be able to describe the problem solved and the criteria applied for its solution.
- Be able to evaluate the concepts, theories, and methodologies applied in the solution of the problem.
- Be able to account for the choices made during the solution of the problem, and substantiate that these are made on a high professional level.
- Be able to assess the limitations of the concepts, theories, and methodologies applied in the solution of the problem.

COMPETENCES

- Be able to analyze and solve an actual problem, of industrial relevance, through application of systematic research and development processes, including advanced analytical, experimental, and/or numerical methods and models.

TYPE OF INSTRUCTION

The teaching is organized in accordance with the general form of teaching. Please see the programme cirruculum §17.

EXTENT AND EXPECTED WORKLOAD

Since it is a 30 ECTS course module the expected workload is 900 hours for the student.

EXAM

EXAMS

Name of exam	Industrial Development
Type of exam	Oral exam based on a project
ECTS	30
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

ADDITIONAL INFORMATION

The project may be finalized with a project report or in the form of a scientific paper with supporting appendices.

FACTS ABOUT THE MODULE

Danish title	Industrielt udviklingsarbejde
Module code	M-MAT-K3-1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	30
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

INDUSTRIAL DEVELOPMENT

2019/2020

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

This module is based on knowledge gained on 2nd semester at the MSc. in Materials Technology program or the like.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Dependent on student's choice of content and organization of the semester; the student may choose between project work at Aalborg University or a voluntary traineeship at a company in Denmark or abroad. The total work load of the semester has to be equivalent to 30 ECTS. If carried out at Aalborg University, the project may be finalized with a project report or in the form of a scientific paper. If continued at the 4th semester, the project is evaluated with a midterm evaluation. For further information about the organisation of the module please see the Joint programme regulations, chapter 2.3., and the study guide for the M.Sc. program in Manufacturing Technology.

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained knowledge and understanding of advanced materials.
- Be able to apply analytical, numerical and experimental methods in relation to verification of material performance.

SKILLS

- Be able to describe the problem solved and the criteria applied for its solution.
- Be able to evaluate the concepts, theories, and methodologies applied in the solution of the problem.
- Be able to account for the choices made during the solution of the problem, and substantiate that these are made on a high professional level.
- Be able to assess the limitations of the concepts, theories, and methodologies applied in the solution of the problem.

COMPETENCES

- Be able to analyze and solve an actual problem, of industrial relevance, through application of systematic research and development processes, including advanced analytical, experimental, and/or numerical methods and models.

TYPE OF INSTRUCTION

Dependent on the student's choice of content and organisation of the semester, the student may choose between project work at Aalborg University and a voluntary traineeship at a company in Denmark or abroad. The total work load of the semester must be equivalent to 30 ECTS. If carried out at Aalborg University, the project may be finalised with a project report or in the form of a scientific paper. If continued on the 4th semester, the project is evaluated via a midterm evaluation. For further information about the organisation of the module, please see the Joint programme regulations, chapter 2.3.

EXTENT AND EXPECTED WORKLOAD

Since it is a 15 ECTS project module the expected workload is 450 hours for the student.

EXAM

EXAMS

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

FACTS ABOUT THE MODULE

Danish title	Industrielt udviklingsarbejde
Module code	M-MAT-K3-O1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science

MASTER'S THESIS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have attained thorough understanding of a broad range of theoretical, numerical and experimental techniques within the area of Materials Engineering.

SKILLS

- Be able to apply scientific methodology to solve a wide variety of problems within the field of specialization.
- Be able to perform scientific work in relevant topics in the field of specialization.
- Be able to apply a wide range of engineering methods in research and development projects in the field of specialization.
- Be able to participate in or lead projects in materials technology, product development, modeling and analysis of material systems and production technology.
- The graduates are expected to have gained a broad knowledge within the areas of Materials Technology. The graduates have knowledge about qualified materials selection, materials behavior to external stimuli, influence of processing on material properties and material microstructure, metallurgy, issues related to polymer chemistry, various material testing methods and simulation of material behavior.

COMPETENCES

- Be able to work independently with a project on a specific problem within their field of interest on the highest possible level within their specialization.
- Be able to take part in technical development and research
- Be able to direct the technical management of development projects within industry.
- Be competent to solve new and complicated technical problems by the use of advanced analytical and experimental techniques.

TYPE OF INSTRUCTION

In this module, the Master's project is carried out. The module constitutes independent project work and concludes the programme. Within the approved topic, the Master's project must document that the level for the programme has been attained.

EXTENT AND EXPECTED WORKLOAD

Since it is a 30 ECTS course module the expected workload is 900 hours for the student.

EXAM

EXAMS

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

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

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	M-MAT-K4-1
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	English
Location of the lecture	Campus Aalborg
Responsible for the module	Jan Schjødt-Thomsen

ORGANISATION

Study Board	Study Board of Mechanical Engineering and Physics
Department	Department of Materials and Production
Faculty	Faculty of Engineering and Science