



AALBORG UNIVERSITET

CURRICULUM FOR THE MASTER'S PROGRAMME IN ROBOTICS, 2019

MASTER OF SCIENCE (MSC) IN ENGINEERING
AALBORG

MODULES INCLUDED IN THE CURRICULUM

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ADVANCED MOBILE ROBOTICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

An important class of robots are mobile robots. A mobile robotic system needs sensing, decision making and propulsion. To this end, this project-module will teach the students how to analyse and implement these capabilities into a mobile robotic application.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of terminology within mobile robotics
- Must have knowledge of different categories of mobile robotic systems
- Must be able to understand how a particular mobile robotic system e.g. the semester project of the student, relates to similar systems
- Must demonstrate knowledge of common strategies for sensing, guidance and control of mobile robotic systems

SKILLS

- Must be able to analyse a problem and suggest a solution that uses relevant theories and methods from mobile robotics
- Must be able to analyse a mobile robotic system and identify relevant constraints and assessment criteria
- Must be able to analyse and implement algorithms (e.g., sensing, path planning, localization, control etc.) of relevance to the chosen mobile robotic system
- Must be able to synthesize, i.e., design and implement, a system (or parts hereof) using relevant theories and methods from mobile robotics
- Must be able to evaluate a mobile robotic system (or parts hereof) with respect to specific assessment criteria
- Can explain the process of and criteria for peer reviewed scientific communications
- Can write a paper for a scientific conference/journal
- Can prepare and give an oral and poster presentation for a scientific conference

COMPETENCES

- Must be able to communicate the above knowledge and skills both orally and in a written report
- Must be able to select relevant mobile robotic theories, methods, and tools, and synthesize them in a new context to produce new knowledge and solutions

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Advanced mobile robotics
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale

Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Avancerede mobile robotter
Module code	ESNROBK1P1
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

ROBOT NAVIGATION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

A mobile robotic system needs to be able to navigate in its environment. This course will teach the students how to self-localize using a combination of sensors, and plan paths and trajectories in order to avoid obstacles.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of sensors for self-localization and obstacle avoidance
- Must have knowledge of map building, internal representations of maps and interpretation of maps
- Must be able to understand the principles of simultaneous localization and mapping

SKILLS

- Must be able to select appropriate sensors or combination of sensors for a specific robot task
- Must be able to combine noisy and imperfect sensor data into a robot pose estimate
- Must be able to implement algorithms for generating paths and/or trajectories towards specified goals
- Must be able to decompose mission objectives into subtasks using state-diagrams or similar and implement algorithms for executing tasks

COMPETENCES

- Must be able to localize and plan a path or trajectory for a specific robot in a complex dynamic environment

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Robot navigation
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Robot navigation
Module code	ESNROBK1K1

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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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Faculty	Technical Faculty of IT and Design

ROBOT MOBILITY

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

Mobile robots use their motors and sensors to move around. This course focuses on theories and methods relating to modelling, simulating and controlling mobile robotic systems.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about mobile robot models, including holonomic and non-holonomic constraints
- Must have knowledge of different categories of mobile robots, such as unmanned aerial vehicles, autonomous boats, omnidirectional vehicles, car-like robots, powered wheelchairs etc.
- Must be able to understand principles of motion coordination between mobile robots
- Must have knowledge of common guidance and control strategies for mobile robots

SKILLS

- Must be able to build and simulate kinematic and dynamic models of mobile robots
- Must be able to follow generated paths or trajectories towards a goal
- Must be able to formulate multivariable control problems in the context of robot mobility

COMPETENCES

- Must be able to model and simulate systems of mobile robots in an environment populated with obstacles
- Must be able to design control systems for mobile robots

EXAM

EXAMS

Name of exam	Robot mobility
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Robot mobilitet
Module code	ESNROBK1K2
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	Tatiana Kozlova Madsen

ORGANISATION

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ADVANCED ROBOTIC PERCEPTION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

A robotic system needs an awareness of its context, i.e. objects and people in its vicinity. To this end, this course will teach the students how to use computer vision and pattern recognition methods to estimate the type of objects in the surroundings and the whereabouts of people nearby.

LEARNING OBJECTIVES

KNOWLEDGE

- Must be able to explain the principles behind robust feature point algorithms
- Must have knowledge of feature selection and reduction methods
- Must have knowledge of motion analysis principles
- Must be able to understand tracking frameworks
- Must be able to understand how advanced perception is integrated into robotic systems (e.g visual servoing, obstacle avoidance)

SKILLS

- Must be able to apply sliding window approaches based on advanced features to detect objects
- Must be able to apply stereo vision to generate 3D data from two or more cameras
- Must be able to apply model-based approaches to estimate the 3D pose of objects and people
- Must be able to apply pattern recognition methods to classify object types and activities
- Must be able to integrate advanced perception into robotic systems

COMPETENCES

- Must be able to analyse a specific problem within mobile robotics and based upon this select, implement and evaluate an appropriate computer vision approach

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Advanced robotic perception
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Avanceret robot perception
Module code	ESNROBK1K3
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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COLLABORATIVE ROBOTICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

Collaborative robots, are robots that are designed to work with humans or together. The objective of this project is to provide students with core competencies within the field of collaborative robotics and hereby enabling them to analyse, design and implement robotic systems that interact and/or integrate with humans.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about the terminology within collaborative robotics
- Must be able to understand how a particular collaborative robotic system e.g. the semester project of the student, relates to similar systems and, if relevant, to the human body and/or the surrounding society

SKILLS

- Must be able to analyse a problem and suggest a solution that uses relevant theories and methods from collaborative robotics
- Must be able to analyse a collaborative robotic system and identify relevant constraints and assessment criteria
- Must be able to synthesize, i.e., design and implement, a system (or parts hereof) using relevant theories and methods from collaborative robotics
- Must be able to evaluate a collaborative robotic system (or parts hereof) with respect to the aforementioned assessment criteria

COMPETENCES

- Must be able to communicate the above knowledge and skills (using proper terminology) both orally and in a written report
- Must be able to select relevant collaborative robotic theories, methods, and tools, and synthesize them in a new context to produce new knowledge and solutions

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Collaborative robotics
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Samarbejdende robotter
Module code	ESNROBK2P1
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	Tatiana Kozlova Madsen

ORGANISATION

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OBJECT MANIPULATION AND TASK PLANNING

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

A robotic system may manipulate objects in its environment in order to carry out a given task. This course will go into details with methods for modelling, planning and control of such tasks. This include robots collaborating. A special focus will be on force-torque and impedance control. The course will also present methods for automatic planning of sequences of elementary operations to enable the robot to achieve higher level task goals.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of principles for decomposing robotic tasks into elementary operations
- Must have knowledge of methods for force-torque and impedance control
- Must have knowledge of methods for modelling of object manipulation activities for feedforward control
- Must have knowledge of principles for planning robotic tasks based on elementary operations
- Must have knowledge of task-driven automatic offline programming

SKILLS

- Must be able to design basic force-torque and impedance control systems
- Must be able to represent a task as a composition of elementary operations using formal methods
- Must be able to realize systems for automatic task planning

COMPETENCES

- Must be able to model and control object manipulation activities
- Must be able to select relevant methods and tools for task decomposition and planning and synthesize them into a system for automatic task execution

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Object manipulation and task planning
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Planlægning og udførelse af opgaver
Module code	ESNROBK2K1
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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HUMAN ROBOT INTERACTION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

The interaction between human and robot is critical for successful collaborative robotics. This course focuses on understanding the fundamentals of human perception, interaction behavior and how to apply this together with technology to successfully solve tasks in collaborative robotics.

LEARNING OBJECTIVES

KNOWLEDGE

- Must be able to describe the human perceptual system
- Must be able to describe basic social communication aspects like proxemics, turn-taking, etc.
- Must be able to describe how the interaction between robot and human is influenced by design aspects such as the degree of autonomy, the design of social perception, embodiment, and input/output modalities
- Must have an overview over different types of human-robotic interfaces
- Must be able to describe potential safety issues in collaborative robotics

SKILLS

- Must be able to analyze collaborative situations and design and implement human-robot interaction based on this analysis
- Must be able to define success criteria for human robot interaction in a given context
- Must be able to evaluate systems of interacting robots and humans
- Must be able to perform usability studies

COMPETENCES

- Must be able to demonstrate an understanding of and critically discuss the need to consider technical, personal, safety, ethical, and societal demands and requirements within the area human-robot interaction
- Must be able to select relevant human-robot-interaction theories, methods, and tools, and synthesize them into an appropriate solution for a given problem

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Human robot interaction
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Menneske-robot interaktion
Module code	ESNROBK2K2
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	Tatiana Kozlova Madsen

ORGANISATION

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HUMAN BIONICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

Controllable bio-mechanical devices added to or merge with the human body have the potential to enhance and enrich the everyday life of people. This course focuses on understanding how such systems can be designed, implemented and evaluated. The student will be equipped with knowledge and skills within bionics focusing on human assistive and rehabilitative robotics.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about bionics and the human neural system
- Must have knowledge about human sensory motor control of movement
- Must have knowledge about invasive and non-invasive human-machine interfacing
- Must have knowledge about neural interfaces
- Must have knowledge of neural integration with external devices, e.g., prosthetics
- Must have an understanding of biologic robotic control
- Must have knowledge about robotic empowerment, e.g., exoskeleton systems, prostheses, assistive robots and their control

SKILLS

- Must be able to apply and understand human-robot interfacing methods and advanced biomechanics
- Must be able to process biological signals for robotic control
- Must be able to close the control loop in systems within human bionics
- Must be able to apply biological signals in control of prostheses and assistive robotics

COMPETENCES

- Must be able to select relevant theories, methods, and tools, to design new solutions

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Human bionics
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Menneskelig bionics
Module code	ESNROBK2K3
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	Tatiana Kozlova Madsen

ORGANISATION

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CONTEXTUAL ROBOTICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

An advanced robotic system will always be integrated into a particular context. The focus of this semester is to expose the students to different contexts and hereby encourage a more holistic mindset. This project will teach the student to select relevant state-of-the-art methods from the field of contextual robotics and synthesize them in a new context to produce new knowledge and solutions.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about the terminology within contextual robotics
- Must be able to understand the notion of innovation and how it relates to contextual robotics

SKILLS

- Must have a solid overview over research within selected subfields of contextual robotics and be able to critically analyze the subfield
- Must be able to analyze a problem and (if possible) suggest a solution that uses relevant theories and methods from contextual robotics
- Must be able to analyze a contextual robotic system and identify relevant constraints and assessment criteria
- Must be able to evaluate a contextual robotic system (or parts hereof) with respect to the aforementioned assessment criteria

COMPETENCES

- Must be able to communicate the above knowledge and skills (using proper terminology) both orally and in a written report
- Must be able to select relevant state-of-the-art methods from the field of contextual robotics and synthesize them in a new context to produce new knowledge and solutions

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Contextual robotics
Type of exam	Oral exam based on a project
ECTS	20
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Kontekstuelle robotter
Module code	ESNROBK3P1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	20
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

READINGS IN ROBOTICS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

The goal of this course is to provide the foundations necessary to perform research within the field of robotics. The course takes a practical approach and focuses on the craftsmanship needed as a scientist. Students explore state of the art theories and techniques in a formalized manner by analyzing a selection of research texts fundamental to robotics through, e.g., paper presentation, reproduction of experiments, etc.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about how to perform a state-of-art analysis
- Must have knowledge about the current research agenda within robotics

SKILLS

- Must be able to analyze specific research topics within robotics
- Must be able to perform critical annotation of relevant robotic literature
- Must be able to define taxonomies for relevant robotic literature

COMPETENCES

- Must be able to critically evaluate a robotic system in relation to state-of-the-art robotic research

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Readings in robotics
Type of exam	Active participation/continuous evaluation
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Studiekreds i Robotik
Module code	ESNROBK3K1
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

INNOVATION AND ENTREPRENEURSHIP

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

Robotics is a subject area characterized by a high level of innovation and entrepreneurship. This course will teach students the basics of innovation-based entrepreneurial processes, business modelling, and enable them to make a business case for a start-up.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of innovation-based entrepreneurial processes, including theories, methods and tools related to the generic innovation sub-processes discovery, incubation and acceleration.
- Must have knowledge of the concept of problem (re)framing and the prototyping process for developing a product/service/business concept
- Must have knowledge about business modeling, intellectual property and startups
- Must have knowledge of the role and impact of corporate entrepreneurship/(radical) innovation in organisations

SKILLS

- Must be able to make use of the theories and methods in entrepreneurial cases/project
- Must be able to collect, use and transform data on user/customer behavior in framing, specification and prototyping.
- Must be able to evaluate theoretic and practical needs for the development of a business/business area
- Must be able to make a business case for a new business area/startup

COMPETENCES

- Must be able to select and use various relevant theoretical perspectives, methods and tools in relation to the planning and engaging in entrepreneurial business development processes
- Must be able to plan and execute a prototyping process that involves users, customers and other relevant stakeholders
- Must be able to contribute constructively and professionally in multidisciplinary innovation/entrepreneurship ventures
- Must be able to evaluate the business case, including funding issues.
- Critically evaluate own analysis and solutions

TYPE OF INSTRUCTION

See the general description of the types of instruction described in § 17.

EXAM

EXAMS

Name of exam	Innovation and entrepreneurship
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed

Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Innovation og entreprenørskab
Module code	ESNROBK3K2
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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ENTREPRENEURIAL PRACTICE

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

Objective:

This project will teach students to develop entrepreneurial practice and develop conceptual solution by combining innovation and/or entrepreneurship theories with empirical insight.

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of processes, methods, tools, and associated resources needed for people and companies to become and stay innovative with an emphasis on incubation processes
- Must apply specific tools and methods for supporting entrepreneurial processes
- Must apply theories of creative methodologies and creative mind-set

SKILLS

- Must be able to use sound research methods to identify and analyse a need or problem using various theoretical perspectives related to a business development processes with an emphasis on incubation processes
- Must be able to experiment with possible conceptual solutions or development in order to develop new business
- Must be able to facilitate creative processes and excel in communication of a business idea

COMPETENCES

- Must be able to approach the field of robotics using scientifically sound methods and informed by experiment with conceptual solutions in relation to market/users, technology, organization, and resource
- Must be able to contribute to creative further development of a conceptual solution by combining innovation and/or entrepreneurship theories with empirical insight
- Must be able to critically evaluate own analysis and solutions

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Entrepreneurial practice
Type of exam	Oral exam based on a project
ECTS	20
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Praktisk entreprenørskab
Module code	ESNROBK3P2
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	20
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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Faculty	Technical Faculty of IT and Design

PROJECT-ORIENTED STUDY IN AN EXTERNAL ORGANISATION

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Has knowledge about the organization of the company and business procedures and policies
- Has knowledge about performance measures in the company
- Has developed a fundamental business sense
- Has knowledge of the competence profile of the program and how the academic internship contributes to the competence profile
- Has gained deepened knowledge into engineering theories and methods within the programme

SKILLS

- Can initiate and ensure the completion of an agreement for the academic internship, with learning objectives corresponding to the semester at the master's program
- Can apply analytic, methodological and/or theoretic skills to address advanced engineering problems in an industrial context
- Can contribute in a professional manner to company objectives as an individual and in teams in accordance with the project management model applied in the company
- Can collaborate and communicate with peers, managers and others
- Can document the academic internship in a report and defend it orally

COMPETENCES

- Can discuss and reflect upon the learning outcomes of the academic internship.
- Can discuss the need for knowledge transfer between academia and industry.
- Has a deepened understanding of the academic interests to pursue in the master's thesis and possible job positions to aim at after graduation

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Project-oriented study in an external organisation
Type of exam	Oral exam based on a project
ECTS	30
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Projektorienteret forløb i en virksomhed
Module code	ESNROBK3P3
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	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
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MASTER'S THESIS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The master thesis can be conducted as a long master thesis. If choosing to do a long master thesis, it has to include experimental work and has to be approved by the study board. The amount of experimental work must reflect the allotted ECTS.

LEARNING OBJECTIVES

KNOWLEDGE

- Have knowledge, at the highest international level of research, of at least one of the core fields of the education
- Have comprehension of implications of research (research ethics).

SKILLS

- Can reflect upon the scientific basis on their knowledge.
- Can argue for the relevance of the chosen problem to the education, including giving a specific account for the core of the problem and the technical context in which it appears
- Can account for possible methods with which to solve the formulated problem of the project, describe and assess the applicability of the chosen method(s), and account for any delimitations made and the way these will influence on the results of the product
- Can analyse and describe the chosen problem applying relevant theories, methods and experimental data
- Can describe the relevant theories and methods in a way that highlights the characteristics and hereby document knowledge of the applied theories, methods, possibilities and delimitations within the relevant problem area
- Can analyse and assess experimental data, including the effect the assessment method has on the validity of the results.

COMPETENCES

- Can communicate scientific problems in writing and orally to specialist and non-specialist
- Can dissect and manage situations that are complex, unpredictable and which require new solutions
- Can independently initiate and perform collaboration within the discipline and interdisciplinary as well, and is able to take professional responsibility
- Can independently take responsibility for his or her own professional development and specialization

TYPE OF INSTRUCTION

Project work individual or in groups of 2-3 persons

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Oral exam based on a project
ECTS	50
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	ESNROBK4P2
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	50
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

MASTER'S THESIS

2019/2020

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The master thesis can be conducted as a long master thesis. If choosing to do a long master thesis, it has to include experimental work and has to be approved by the study board. The amount of experimental work must reflect the allotted ECTS.

LEARNING OBJECTIVES

KNOWLEDGE

- Have knowledge, at the highest international level of research, of at least one of the core fields of the education
- Have comprehension of implications of research (research ethics).

SKILLS

- Can reflect upon the scientific basis on their knowledge.
- Can argue for the relevance of the chosen problem to the education, including giving a specific account for the core of the problem and the technical context in which it appears
- Can account for possible methods with which to solve the formulated problem of the project, describe and assess the applicability of the chosen method(s), and account for any delimitations made and the way these will influence on the results of the product
- Can analyse and describe the chosen problem applying relevant theories, methods and experimental data
- Can describe the relevant theories and methods in a way that highlights the characteristics and hereby document knowledge of the applied theories, methods, possibilities and delimitations within the relevant problem area
- Can analyse and assess experimental data, including the effect the assessment method has on the validity of the results.

COMPETENCES

- Can communicate scientific problems in writing and orally to specialist and non-specialist
- Can dissect and manage situations that are complex, unpredictable and which require new solutions
- Can independently initiate and perform collaboration within the discipline and interdisciplinary as well, and is able to take professional responsibility
- Can independently take responsibility for his or her own professional development and specialization

TYPE OF INSTRUCTION

Project work individual or in groups of 2-3 persons

EXAM

EXAMS

Name of exam	Master's Thesis
Type of exam	Oral exam based on a project
ECTS	30
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	As stated in the Joint Programme Regulations.

FACTS ABOUT THE MODULE

Danish title	Kandidatspeciale
Module code	ESNROBK4P1
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design