Modulhandbuch
Masterstudiengang „Space Engineering“

Fachbereich Produktionstechnik
Universität Bremen

Abschnitt	Modul	Veranstaltung	CP	Semester	Dozenten
Foundations (30CP)	Inverse Methods and Data Analysis	Inverse Methods	6	WS	King, Schlitzer
	Science and Exploration Missions	Science and Exploration Missions	3	WS	Lämmerzahl
	Control Theory I	Control Theory I	3	WS	Michels
	Atmospheric Physics	Atmospheric Physics	6	WS	Burrows
	Space Electronics	Space Electronics	6	WS	Paul, Garcia
	Communication Technology	Communication Technology	6	WS	Dekorzy
Compulsory Modules (36CP)	Space Flight Theory	Mission Analysis	3	WS	Hallmann
		Mission Design	1,5	SS	List
		Trajectory Optimization	4,5	WS	Büskens, Knauer
	Space Environment and Testing	Space Environment and S/C Qualification	3	SS	Dittus
		Design of Space Vehicles	3	WS	Rittweger, Spröwitz
		Product Assurance and Space Technology	3	SS	Braxmaier, Grosse
	Satellite Systems	Thermal Control of Satellites	3	WS	Dittus
		Structural Design and Analysis	3	SS	Rittweger
		Space Systems Engineering / Concurrent Engineering	3	WS	Romberg
	Subsystems	Orbital Systems	3	SS	Rickmers
		Space Propulsion Systems 1	3	SS	Sippel
		Spacecraft Navigation and Control	3	WS	Theil
Elective Modules (12 CP)	Space Flight Politics	Cost Estimation for Space Systems	3	WS	Wörner, Müller
		Space Agency Relations and Commercial Space	3	WS	Kessler
	Space Missions	Space Propulsion Systems 2	3	WS	Sippel

		Research and Exploration Missions	3	SS	Lämmerzahl, Scharringhausen
	Flight Loads	Fatigue & Loads	3	WS	Degenhardt
		Scientific Payloads	3	SS	Herrmann, Braxmaier
	Space Flight IT	On-Board Data Handling	3	SS	Dannemann
		Specification of Embedded Systems	3	SS	Paleska
	Master Project	Projektarbeit	12		
	Master Thesis	Masterarbeit	24		
		Kolloquium	6		

Module Descriptions

Foundations (30CP)
- Inverse Methods and Data Analysis
- Science and Exploration Missions
- Control Theory I
- Atmospheric Physics
- Space Electronics
- Communication Technology

Compulsory Modules (36CP)
- Space Flight Theory
- Space Environment and Testing
- Satellite Systems
- Subsystems

Elective Modules (12CP)
- Space Flight Politics
- Space Missions
- Flight Loads
- Space Flight IT

Master Project (12CP)
- Master Project

Master Thesis (30CP)
- Master Thesis

Module Descriptions

Foundations (30CP)

Module Title	Inverse Methods and Data Analysis
Responsible for the module / Module assignment	Prof. Schlitzer
Assignment to study process	Inverse Methods (Prof. Schlitzer/Prof. King) 6CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	4 SWH
Duration / Semester	1 Semester
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Module Title	Science and Exploration Missions
Responsible for the module / Module assignment	Prof. Lämmerzahl
Assignment to study process	Science and Exploration Missions (Prof. Lämmerzahl) 3CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	2 SWH
Duration / Semester	1 Semester
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Module Title	Control Theory I
Responsible for the module / Module assignment	Prof. Michels
Assignment to study process	Control Theory I (Prof. Michels) 3CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	2 SWH
Duration / Semester	1 Semester
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Module Title	Atmospheric Physics
Responsible for the module / Module assignment	Prof. Burrows
Assignment to study process	Atmospheric Physics (Prof. Burrows) 6CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	4 SWH
Duration / Semester	1 Semester
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Module Title	Space Electronics
Responsible for the module / Module assignment	Prof. Paul
Assignment to study process	Space Electronics (Prof. Paul/Prof. Garcia) 6CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	4 SWH
Duration / Semester	1 Semester
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Module Title	Communication Technologies
Responsible for the module / Module assignment	Prof. Dekorsy
Assignment to study process	Communication Technologies (Prof. Dekorsy) 6CP
Work load / Credit points	**tba**
Compulsory / Optional	Compulsory
Semester weekly hours	4 SWH
Duration / Semester	1 Semester
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	**tba**
Content	**tba**
Course and examination performance, type of exam	**tba**
Literature	**tba**

Compulsory Modules (36CP)

Module Title	Space Flight Theory
Responsible for the module / Module assignment	Prof. Büskens
Assignment to study process	Mission Analysis (Hallmann, Dr. Quantus) 3CP Mission Design (Dr. List) 1,5 CP Trajectory Optimization (Prof. Büskens, Dr. Knauer) 4,5CP
Work load / Credit points	9 CP, 270 h **Mission Analysis (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Mission Design (1SWH)** •presence (L + EC): 14 h (1 SWH x 14 weeks) •learning + examples: 14 h (1 SWH x 14 weeks) •preparation for examination: 2*8h + 2h exam=18 h **Trajectory Optimization (3SWH)** •presence (L + EC): 42 h (3 SWH x 14 weeks) •learning + examples: 42 h (3 SWH x 14 weeks) •preparation for examination: 6*8h + 2h exam = 50h
Compulsory / Optional	Compulsory
Semester weekly hours	6 SWH
Duration / Semester	2 semesters
Requirements for participation	None
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in: •Space mission analysis and design (tools) •Orbital and attitude dynamics •Modeling approaches of space environment •Satellite system modeling (thermal, sensors, actuators) •Definitions and technical terms of space applications and optimization •Mathematical models and problem statements relating to space applications •Using mathematical software •Numerical solution of mathematical problems
Content	•Trajectory computation and space flight analysis •Basic principles for designing and analysing a space mission
•Course and examination performance, type of exam	3 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Mission Analysis (WS) 3CP** **Mission Design (SS) 1,5CP** **Trajectory Optimization (WS) 4,5CP**
Literature	

Module Title	Space Environmment and Testing
Responsible for the module / Module assignment	Prof. Braxmaier
Assignment to study process	Space Environment and S/C qualification (Prof. Dittus) 3CP Design of Space Vehicles (Prof. Rittweger) 3CP Product Assurance & Space Technology (Prof. Braxmaier, Dr.-Ing. Grosse) 3CP
Work load / Credit points	9 CP, 270 h **Space Environment and S/C qualification (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Design of Space Vehicles (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Product Assurance & Space Technology (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Compulsory
Semester weekly hours	6 SWH
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in: •Space Environment and conditions of Satellites for scenarios close to Earth and in deep space •System design and analysis of launchers, satellites, landers, orbital systems •Multi-disciplinary interface relations between mission analysis, space flight mechanics, propulsion system, flight control, mechanical and thermal design •Ability of simplified modeling •Derivation of the essential dimensioning variables •Capability of system pre-design of space structures •Quality, reliability and risk •Influence of errors to costs •Methods to handle and control / Systems engineering •Influence to the development of Space technologies
Content	•Space environment and vehicle specification needs •Design and development of space vehicles •Proof and product assurance
•Course and examination performance, type of exam	3 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Space Environment and S/C qualification (SS) 3CP** **Design of Space Vehicles (WS) 3CP** **Product Assurance & Space Technology (SS) 3CP**
Literature	•

Module Title	Satellite Systems
Responsible for the module / Module assignment	Prof. Dittus
Assignment to study process	Thermal Control of Satellites (Prof. Dittus) 3CP Stuctural Design and Analysis (Prof. Rittweger) 3CP Space Systems Engineering / Concurrent Engineering (Dr. Romberg) 3CP
Work load / Credit points	9 CP, 270 h **Thermal Control of Satellites (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Stuctural Design and Analysis (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Space Systems Engineering / Concurrent Engineering (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Compulsory
Semester weekly hours	6 SWH
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in: •Thermal Control System of a Satellite •Design process •Analysis of light weight structures with reasonable methods •Building of simplified physical models •Capability of pre-dimensioning of space structures •Fundamentals of space project management (theory) •Fundamentals of space systems and concurrent engineering (theory) •Application of concurrent engineering in the frame of an example project (Phase 0/A design level)
Content	•Thermal control at space vehicles •Analysis of space systems •Structural design and engineering
•Course and examination performance, type of exam	3 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Thermal Control of Satellites (WS) 3CP** **Stuctural Design and Analysis (SS) 3CP** **Space Systems Engineering / Concurrent Engineering (WS) 3CP**
Literature	•

Module Title	Subsystems
Responsible for the module / Module assignment	Prof. Rittweger
Assignment to study process	Orbital Systems (Dr. Rickmers) 3CP Space Propulsion Systems 1 (Dr. Sippel) 3CP Spacecraft Navigation and Control (Dr. Theil) 3CP
Work load / Credit points	9 CP, 270 h **Orbital Systems (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Space Propulsion Systems 1 (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Spacecraft Navigation and Control (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Compulsory
Semester weekly hours	6 SWH
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •Design for orbital and interplanetary spacecraft (Phase 0/A/B) •Design of spacecraft subsystems: Power, propulsion, C&DH, AOCS, thermal, telecom, structure •Functional principles of all major types of space propulsion. •Main components of chemical rocket propulsion and their most important design criteria •Informed assessment of advantages and disadvantages of the different concepts and understanding the challenges to future developments •Overview of design, concepts and elements of a navigation and control subsystem for a spacecraft and their functions •Typical sensors and actuators used for spacecraft navigation and control •Methods for state estimation used in spacecraft navigation systems •Concepts for controlling spacecraft
•Content	•Subsystems for Space Missions •Propulsion and Attitude Control Systems •Power and Thermal systems •Command & Data Handeling

•**Course and examination performance, type of exam**	3 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Orbital Systems (SS) 3CP** **Space Propulsion Systems 1 (SS) 3CP** **Spacecraft Navigation and Control (WS) 3CP**
Literature	•

Elective Modules (12CP)

Module Title	Space Flight Politics
Responsible for the module / Module assignment	Prof. Braxmaier
Assignment to study process	Cost Estimations for Space Systems (Dr. Wörner) 3CP Space Agency Relations and Commercial Space (Kessler) 3CP
Work load / Credit points	6CP, 180h **Cost Estimations for Space Systems (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Space Agency Relations and Commercial Space (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Optional
Semester weekly hours	4
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •Cost engineering application in industry •Key cost estimation methods •Awareness of cost estimation models which are commonly applied within the space sector •Applicability of cost estimation methods w.r.t. program phase •Parametric approach and CER theory •Types of cost estimations encountered in industry •Life cycle cost (LCC) theory and analysis, and understanding the three constituent and classic cost estimation categories (with examples) •Key factors and complexities which influence cost within a space program •Performing basic cost estimation for select space programs at system level •Difference between risk and uncertainty, and the latter w.r.t. cost estimation •Cost estimation and its interrelation within overall project framework (i.e. cost estimation and program management interrelation) •Impact of current and actual space commercialization activities on program costs, and consequently, cost estimation approaches, validity/accuracy and representativeness •How space agencies work, their tasks and relations •Proposal development for space projects •International relations and cooperation in the space sector

	•Commercial space projects and endeavors
Content	Definition of cost engineering, cost estimation and their interrelation and application of cost engineering and estimation within industry (importance, relevance, examples) are central parts. Introduction of key industry accepted and utilized cost estimation (CE) methods, including pros and cons, and highlighting applicability w.r.t. program phase. Distinction between CE methods and CE models. Discussion and study of CE models commonly/frequently used in the space industry. National and international Space agencies (i.e. DLR, ESA, EU, EUMETSAT, NASA, UNO etc.): Organization, Roles and responsibilities, Cooperation, Cooperation Agency – Industry, National and international space strategy are discussed in this module. Management of space programs and further examples of commercial space projects with an introduction on how to start your own space project/company. Finally an introduction on how to develop a proposal for a national or international space project is given.
•Course and examination performance, type of exam	2 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Cost Estimations for Space Systems (WS) 3CP** **Space Agency Relations and Commercial Space (WS) 3CP**
Literature	•

Module Title	Space Missions
Responsible for the module / Module assignment	Prof. Lämmerzahl
Assignment to study process	Space Propulsion Systems 2 (Dr. Sippel) 3CP Research and Exploration Missions (Prof. Lämmerzahl, Dr. Scharringhausen) 3CP
Work load / Credit points	6CP, 180h **Space Propulsion Systems 2 (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Research and Exploration Missions (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Optional
Semester weekly hours	4
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in: •functional principles of all major types of space propulsion. •main components of chemical rocket propulsion and their most important design criteria •advantages and disadvantages of the different concepts and understanding the challenges to future developments •overview on a class of science and exploration missions •introduction into modern science quests regarding physics •introduction to the space conditions •introduction into the main and modern questions regarding planetary sciences •introduction into payloads needed for these mission
Content	Introduction of completed and planned space missions, Examples are Gravity Probe A for testing the gravitational redshift, Gravity Probe B for testing the gravitomagnetic Schiff effect, Cassini for Saturn exploration and testing the gravitational time delay, Pioneer for planetary exploration and testing the gravitational field in the Solar system, MICROSCOPE for testing the Equivalence Principle, LISA for searching for gravitational waves and the technology mission LISA pathfinder, GRACE and GRACE-FO for satellite based geodesy, ACES on the ISS for testing relativity and establishing space-based metrology, further missions testing Special and General Relativity using quantum optics, asteroid and comet missions HAYABUSA and Rosetta. For each mission the requirements on the payload technology, the spacecraft technology, and on the mission scenario will be derived.

Course and examination performance, type of exam	2 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Space Propulsion Systems 2 (WS) 3CP** **Research and Exploration Missions (SS) 3CP**
Literature	•

Module Title	Flight Loads
Responsible for the module / Module assignment	Prof. Braxmaier
Assignment to study process	Fatigue & Loads (Prof. Degenhardt) 3CP Scientific Payloads (Dr. Herrmann, Prof. Braxmaier) 3CP
Work load / Credit points	6CP, 180h **Fatigue & Loads (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Scientific Payloads (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Optional
Semester weekly hours	4
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •Structural behavior of different type of structures under different loading conditions •Applications in aerospace •Simplified design methods •Design of metallic and composites structures under fatigue loading •Basic load cases in aerospace •General Understanding of Qualification Process of Payloads •Structure of Payloads in Conjunction to the Bus •Understanding: Basic Sensors and Instruments •Assembly and Integration Techniques
Content	An Introduction of basic terminology, damage tolerance, redundant structures and statistics shall be given. Also Principle of virtual displacements and definition of Load-factor method is explained. Design of metallic structures under fatigue loading and Fracture mechanics as nonlinear behavior of composite structures is part of the module. Especially Fatigue & Damage tolerance of composite structures and loads in aerospace applications (main load cases, v-n-diagram) are defining the technical part of this mule. This knowledge is needed for understanding examples of Payloads for Missions in Science and Earth Observation and examples of Instruments and Sensor Systems. Furthermore physical basics for selected instruments and sensors including AI technologies shall be content of this module. Definitions of Technology Readiness Level (TRL) and the qualification of Payloads rounds the contents up.

Course and examination performance, type of exam	2 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **Fatigue & Loads (WS) 3CP** **Scientific Payloads (SS) 3CP**
Literature	•

Module Title	Space Flight Information Technology
Responsible for the module / Module assignment	Prof. Paleska
Assignment to study process	On-Board Data Handling (Dr. Dannemann) 3CP Specification of Embedded Systems (Prof. Paleska) 3CP
Work load / Credit points	6CP, 180h **On-Board Data Handling (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h **Specification of Embedded Systems (2SWH)** •presence (L + EC): 28 h (2 SWH x 14 weeks) •learning + examples: 28 h (2 SWH x 14 weeks) •preparation for examination: 4*8h + 2h exam=34h
Compulsory / Optional	Optional
Semester weekly hours	4
Duration / Semester	2 semesters
Requirements for participation	none
Offered frequency	Annually
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •Being able to explain typical scenarios for space missions •Being able to understand and derive mission-specific requirements for the On-Board Data Handling (OBDH) system •Being able to explain relevant standards •Being able to explain and justify typical test approaches for OBDH systems •Understanding approaches for Failure Detection Isolation and Recovery (FDIR) •Ability to specify an OBDH system •Understand characteristics of specification and modeling formalisms suitable for embedded or cyber-physical systems. •Understand the semantic foundations for these formalisms. •Understand the characteristics of domain-specific modeling formalisms and the basics of model-driven development, including automated code generation from these models. •Learn about the actual research foci in this area.
Content	Introduction of modeling formalism suitable for distributed embedded real-time systems and cyber-physical systems. This includes semantic concepts and their practical application in model checking, simulation and testing. SysML-like modeling formalisms and domain-specific formalisms as concrete examples for modeling approaches. Traceability from requirements via models to code and verification and validation results. Specification of properties by means of temporal logic. The model-driven development paradigm and automated code generation from domain-specific models. On-Board Data Handling (OBDH) includes

	all aspects of embedded real-time systems from payload data processing to mission critical control tasks. The OBDH system can in principle be considered as an embedded system that is subject to strong requirements with respect to reliability and availability in harsh environments with minimal or no maintenance. Therefore the module considers various aspects from general mission scenarios and their impact on the OBDH system, examples for typical architecture, techniques for Failure Detection Isolation and Recovery (FDIR) and approaches for guaranteeing functional correctness of the hardware and/or software. Relevant standards are introduced.
Course and examination performance, type of exam	2 exams (TP) corresponding to AT MPO, distributed on winter and summer term (WS/SS) as follows: **On-Board Data Handling (SS) 3CP** **Specification of Embedded Systems (SS) 3CP**
Literature	•

Master Project (12CP)

Module Title	Master Project
Responsible for the module / Module assignment	MPA Space Engineering
Assignment to study process	Changing offer each semesters Project is supervised at associated chair
Work load / Credit points	12 CP (equal to 360h)
Compulsory / Optional	Optional
Semester weekly hours	4
Duration / Semester	2 semesters project has to absolved within one study year topic is defined in study planning of study programs
Requirements for participation	none
Offered frequency	Each semester
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •working on a scientific topic •concluding scientific results in a colaborating team •project management •concluding scientific results in textform •discussing and presenting own results •communication and presentation techniques
Content	The student has to work on an applied or scientific project during the working time. Result should be finishing a project or a clear defined part of it.
Course and examination performance, type of exam	Course and examination performance: Increasing need of mentoring performance because of high-tech application.
Literature	•

Master Thesis (30CP)

Module Title	Master Thesis
Responsible for the module / Module assignment	-
Assignment to study process	-
Work load / Credit points	30 CP
Compulsory / Optional	Compulsory
Semester weekly hours	-
Duration / Semester	corresponding MPO
Requirements for participation	none
Offered frequency	-
Course language	English
Learning Outcome	Students have knowledge/responsibilities in •long-time working on a scientific topic •making recherches of previous research results •developing own theories •discussing and comparing other work with own results •concluding results in a written thesis
Content	The student has to work on an applied or scientific project during the working time. Result should be finishing a project or a clear defined part of it.
•Course and examination performance, type of exam	Thesis and Presentation of results
Literature	•