

Module Handbook,
Faculty of Engineering
Degree programme in Intelligent Mechatronic
Systems leading to a Master of Engineering
(M.Eng.)

Date of introduction	1 September 2026
Programme Director:	Prof. Dr.-Ing. Peter Ott
Date of creation:	17 June 2026
Study Programme Outline:	1

Overview of the modules and courses in the degree programme

Type	Name	Coordinator
Module	Methods and Processes 1	Prof. Dr.-Ing. Peter Ott
Module	Methods and Processes 2	Prof. Dr.-Ing. Peter Ott
Module	Elective modules 1	Prof. Dr.-Ing. Peter Ott
Module	Engineering Project	Prof. Dr.-Ing. Peter Ott
Course	Engineering Project	Prof. Dr.-Ing. Peter Ott
Course	Engineering Project Colloquium	Prof. Dr.-Ing. Peter Ott
Course	Academic and Professional Skills	Prof. Dr.-Ing. Peter Ott
Module	Languages	Prof. Dr.-Ing. Peter Ott
Module	Supervised Studies	Prof. Dr.-Ing. Peter Ott
Module	Master's Thesis	Prof. Dr.-Ing. Peter Ott
Course	Master's Thesis	Prof. Dr.-Ing. Peter Ott
Course	Master's Thesis Colloquium	Prof. Dr.-Ing. Peter Ott
Course	Numerical and Optimization Methods	Prof. Dr.-Ing. Peter Ott
Course	Statistical Methods	Prof. Dr. rer. nat. Priska Jahnke
Course	Selected Topics in Mathematics	Prof. Dr. rer. nat. Nikolas Akerblom
Course	Design of Experiments	Prof. Dr. rer. nat. Carsten Pargmann

Module 617010 Methods and Processes 1

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	5
Total workload (hours)	125
SWS	See course(s)
Prerequisites for participation	None
Requirements for the award of credit points (assessment method)	Lx
Additional information on the assessment method	Assessment method: Lx (portfolio comprising several assessed individual pieces of work) Grading bands: - Number of individual pieces of work: 2–4 - Type of assessments: A combination of written assignments, presentations, exercises, case studies and laboratory reports - Written components: 5–10 pages per individual piece of work (approx. 9,000–18,000 characters) - Presentations: 5–10 minutes - Submission formats and assessment: to be announced at the start of the semester in accordance with the general study regulations
Teaching and learning methods	See course(s)
Course content	Students choose from the following modules: Numerical and Optimisation Methods, Statistical Methods, Selected Topics in Mathematics or Design of Experiments
Intended learning outcomes	Students gain a sound understanding of mathematical, signal processing and simulation-based methods as required for the analysis, modelling and control of mechatronic and robotic systems. These skills enable them to tackle complex interdisciplinary tasks as early as in project work or their final dissertation. Particular emphasis is placed on ensuring practical applicability in industrial robotics, sensor technology and automation engineering.

Literature/Learning resources	See course(s)
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Module 617020 Methods and Processes 2

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	5
Total workload (hours)	125
SWS	See course(s)
Prerequisites for participation	None
Requirements for the award of credit points (assessment method)	Lx
Further details on the assessment method	Assessment method: Lx (portfolio comprising several assessed individual pieces of work) Grading bands: - Number of individual pieces of work: 2–4 - Type of assessments: A combination of written assignments, presentations, exercises, case studies and laboratory reports - Written components: 5–10 pages per individual piece of work (approx. 9,000–18,000 characters) - Presentations: 5–10 minutes - Submission formats and assessment: to be announced at the start of the semester in accordance with the general study regulations
Teaching and learning methods	See course(s)
Course content	Students choose from the following modules: Numerical and Optimisation Methods, Statistical Methods, Selected Topics in Mathematics or Design of Experiments
Intended learning outcomes	Students gain a sound understanding of mathematical, signal processing and simulation-based methods as required for the analysis, modelling and control of mechatronic and robotic systems. These skills enable them to tackle complex interdisciplinary tasks in project work or their final dissertation. Particular emphasis is placed on ensuring practical applicability in industrial robotics, sensor technology and automation engineering.

Literature/Learning resources	See course(s)
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Module 617030 Electives 1

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	2
Credit points (ECTS)	25
Total workload (hours)	625
SWS	See course(s)
Prerequisites for participation	None
Requirements for the award of credit points (assessment method)	Lx
Further details on the assessment method	Assessment method: Lx (portfolio comprising several assessed individual pieces of work) Grading bands: - Number of individual pieces of work: 2–4 - Type of assessments: A combination of written assignments, presentations, exercises, case studies and laboratory reports - Written components: 5–10 pages per individual piece of work (approx. 9,000–18,000 characters) - Presentations: 5–10 minutes - Submission formats and assessment: to be announced at the start of the semester in accordance with the general study regulations
Teaching and learning methods	See course(s)
Course content	See course(s)
Intended learning outcomes	The electives deepen academic and practical skills, promote teamwork and subject-specific communication, and strengthen the ability to , contextualise and apply content independently.
Literature/Learning resources	See course(s)

Module 617040 Engineering Project

Responsible person	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	2
Credit points (ECTS)	15
Total workload (hours)	375
SWS	5
Entry requirements	None
Requirements for the award of credit points (assessment method)	LA, SR, LA
Additional information on the assessment method	See course(s)
Teaching and learning methods	See course(s)
Course content	The course content covers project planning, scientific methods, interdisciplinary collaboration, structured problem-solving, research, documentation, technical analysis and the practical application of project management tools in complex research scenarios.
Intended learning outcomes	Students independently familiarise themselves with a complex research topic, tackle it in an interdisciplinary team setting, and apply scientific methods and project management tools in the process. They acquire in-depth specialist knowledge, strengthen their teamwork skills and expand their ability to solve challenging tasks independently, in a practical manner and in accordance with industry standards.
Literature/Learning resources	See course(s)

Course 617041 Engineering Project

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	2
Credit points (ECTS)	10
Total workload (hours)	250
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LA
Additional information on the assessment method	None
Teaching and learning methods	Laboratory
Course content	See module description
Intended learning outcomes	Students work independently on a complex research topic, applying scientific methods and project management tools. They acquire in-depth specialist knowledge and strengthen their ability to work in a team
Literature/Learning resources	

Course 617042 Engineering Project Colloquium

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	1
Entry requirements	None
Requirements for the award of credit points (assessment method)	SR
Additional information on the assessment method	None
Teaching and learning methods	Seminar
Course content	In the colloquium, students present their project topic, explain their approach, present relevant results and discuss their significance for technical systems or applications.
Intended learning outcomes	Students should be able to communicate complex interrelationships clearly, justify methodological decisions and present their findings with technical confidence. The aim is to engage in confident academic discussion at an expert level.
Literature/Learning Resources	

Course 617043: Academic and Professional Skills

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LA
Additional information on the assessment method	None
Teaching and learning methods	Lecture with integrated tutorial
Course content	???
Intended learning outcomes	???
Reading list/learning resources	

Module 617050 Languages

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	5
Total workload (hours)	125
SWS	See course(s)
Prerequisites for participation	None
Requirements for the award of credit points (assessment method)	Lx
Additional information on the assessment method	Assessment method: Lx (portfolio comprising several assessed individual pieces of work) Grading bands: - Number of individual pieces of work: 2–4 - Type of assessments: A combination of written assignments, presentations, exercises, case studies and laboratory reports - Written components: 5–10 pages per individual piece of work (approx. 9,000–18,000 characters) - Presentations: 5–10 minutes - Assignment formats and assessment: will be announced at the start of the semester in accordance with the general study regulations
Teaching and learning methods	See course(s)
Course content	???
Intended learning outcomes	???
Reading list/learning resources	See course(s)

Module 617060 Advised Studies

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	5
Total workload (hours)	125
SWS	See course(s)
Prerequisites for participation	None
Requirements for the award of credit points (assessment method)	Lx
Further details on the assessment method	Assessment method: Lx (portfolio comprising several assessed individual pieces of work) Grading bands: - Number of individual pieces of work: 2–4 - Type of assessments: A combination of written assignments, presentations, exercises, case studies and laboratory reports - Written components: 5–10 pages per individual piece of work (approx. 9,000–18,000 characters) - Presentations: 5–10 minutes - Submission formats and assessment: to be announced at the start of the semester in accordance with the general study regulations
Teaching and learning methods	See course(s)
Course content	???
Intended learning outcomes	???
Reading list/learning resources	See course(s)

Module 617070 Master's Thesis

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	30
Total workload (hours)	750
SWS	0
Entry requirements	None
Requirements for the award of credit points (assessment method)	PT, SR
Further details on the assessment method	See course(s)
Teaching and learning methods	See course(s)
Course content	Students tackle a complex academic problem using appropriate methods. They define objectives, analyse relevant research, develop potential solutions and document their findings in a structured manner. In the seminar, they present their work, explain their approach and conclusions, and discuss these in a substantively sound manner.
Intended learning outcomes	Students are able to analyse academic problems independently, address them methodically and document their findings clearly. They are able to critically , present them convincingly from a subject-specific perspective, and defend them in academic discourse. The module strengthens their research, communication and personal skills.
Literature/Learning resources	See course(s)

Course 617071 Master's Thesis

Lecturer	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	28
Total workload (hours)	700
SWS	0
Entry requirements	The Master's thesis may be registered no earlier than after the lecture period of the second semester. Registration of the Master's thesis requires the approval of the chair of the relevant examination board.
Requirements for the award of credit points (examination format)	PT
Further details on the examination format	The written thesis comprises approximately 50–80 pages (approximately 90,000–150,000 characters, excluding figures and appendices). The exact length is defined by the principal supervisor at the start of the thesis. The time allowed for completion is 20 weeks.
Teaching and learning methods	-
Course content	Students undertake an interdisciplinary research topic with clear objectives and a defined task. They explain the chosen methodology, analyse existing research on mechatronic or robotic systems, and address the problem experimentally, through design or using a model-based approach. Results are scientifically evaluated, discussed and summarised with well-founded conclusions.
Intended learning outcomes	Students should be able to solve complex mechatronic or robotic problems using scientific methods, present results clearly and document them precisely in writing. They develop the ability to analyse independently, reflect critically and present technically convincing arguments. The aim is to achieve a confident command of scientific working methods in interdisciplinary technical systems.
Literature/Learning resources	

Event 617072 Master's Thesis Colloquium

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2
Total workload (hours)	50
SWS	0
Entry requirements	None
Requirements for the award of credit points (assessment method)	SR
Further details on the assessment method	The duration is usually 20–30 minutes. Components: - Presentation (10–15 mins) - Discussion (10–15 mins) The allocation of time is determined by the principal examiner
Teaching and learning methods	Seminar
Course content	In the colloquium, students explain the content of their interdisciplinary thesis, describe the methodology and technical implementation, and evaluate the results in relation to mechatronic or robotic systems.
Intended learning outcomes	Students should be able to communicate complex interrelationships clearly, justify methodological decisions and present their findings with technical confidence. The aim is to engage in confident academic discussion at an expert level.
Literature/Learning Resources	

Course 617401 Numerical and Optimization Methods

Course coordinator	Prof. Dr.-Ing. Peter Ott
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LP
Additional information on the assessment method	None
Teaching and learning methods	Lecture with integrated tutorial
Course content	2. Numerical differentiation 2. Interpolation 3. B-splines and NURBS 4. Numerical integration and Monte Carlo methods 5. Zero Finding 6. Numerical Methods for Ordinary Differential Equations 8. Linear Least Squares Methods 9. Non-linear Least Squares and General Optimisation Methods 10. Neural Network Training Algorithms
Intended learning outcomes	Students will understand the fundamentals and properties of the methods and algorithms covered. Students will be able to apply the methods and algorithms, for example, using MATLAB.
Bibliography/Learning Resources	Dahmen, Wolfgang, Reusken, Arnold Numerical Methods for Engineers and Scientists: Springer Berlin Heidelberg 2008 Berlin, Heidelberg Braga-Neto, Ulisses Fundamentals of Pattern Recognition and Machine Learning: Springer International Publishing 2020, Cham

Course 617402 Statistical Methods

Course coordinator	Prof. Dr. rer. nat. Priska Jahnke
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LK 60
Additional information on the examination format	None
Teaching and learning methods	Lecture with integrated practical session
Course content	The introduction to regression analysis covers probability and conditional distributions as the basis of statistical modelling. Building on this, the regression line of the population describes the ideal linear relationship between variables. As the true parameters are unknown, they are estimated in the linear regression model using sample data, usually by the method of least squares.
Intended learning outcomes	Students acquire in-depth mathematical knowledge for engineering applications and develop abstract and analytical thinking skills. They apply their knowledge to new areas and are introduced to stochastic thinking through linear regression analysis. They also become proficient in working with time series, distributions and regression estimates. Through group work, they strengthen their communication skills and independently expand their knowledge using specialist literature.
Literature/Learning resources	- Beichelt, Stochastics for Engineers – Bosch, Elementary Introduction to Probability Theory – Bosch, Elementary Introduction to Applied Statistics – Sell, Lecture notes

Course 617403: Selected Topics in Mathematics

Course coordinator	Prof. Dr. rer. nat. Nikolas Akerblom
Frequency of the course	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LK 60
Additional information on the examination format	None
Teaching and learning methods	Lecture with integrated practical session
Course content	The course 'Selected Topics in Mathematics' covers various topics in engineering mathematics. Possible lecture topics include rotations in two and three dimensions, with complex numbers and linear mappings playing a central role. Function theory is also covered, including complex numbers, conformal mappings and their derivatives and integrals. These topics are logically interconnected and provide a comprehensive understanding of the complex structures in engineering mathematics.
Intended learning outcomes	Upon completion of the course, students will be able to master mathematical knowledge in an advanced area of engineering mathematics and transfer this to other sub-fields or applications. They will possess the capacity for abstraction and the ability to recognise analogies and patterns, enabling them to engage in conceptual, analytical and logical thinking. Through group work and discussions, they learn to classify, identify, formulate and solve maths-related problems, and to gather, evaluate and interpret relevant information independently and effectively.
Reading list/study resources	To be announced in the lecture. Examples: Papula: Volumes 1, 2, 3; Burg, Haf, Wille: Various volumes

Course 617404: Design of Experiments

Lecturer	Prof. Dr. rer. nat. Carsten Pargmann
Frequency	Every semester
Duration of the module (semesters)	1
Credit points (ECTS)	2.5
Total workload (hours)	62.5
SWS	2
Entry requirements	None
Requirements for the award of credit points (assessment method)	LK 90
Additional information on the examination format	None
Teaching and learning methods	Lecture with integrated practical session
Course content	This course covers the fundamentals of statistical experimental design, including full- and partial-factorial designs, as well as Box-Behnken, CCD and optimal experimental designs. The course also covers methods for analysing experimental data, the mathematical foundations of statistics and analysis of variance. Students will learn to select appropriate experimental strategies, plan experiments systematically and interpret results in a well-founded manner.
Intended learning outcomes	The course enables students to apply statistical experimental design methods to analyse and optimise technical processes and products. Using examples from mechanical engineering, automotive engineering, mechatronics and electronics, they deepen their understanding of engineering methods. Through collaborative tasks, they enhance their communication skills. Furthermore, they learn to independently identify and formulate experimental problems and to resolve them through well-founded research. This strengthens their ability to systematically organise complex development processes and make decisions in day-to-day engineering practice.
Bibliography/Learning Resources	Douglas Montgomery: "Design and Analysis of Experiments" George E. P. Box, J. Stuart Hunter, William G. Hunter: "Statistics for Experimenters: Design, Innovation, and Discovery" Karl Siebertz, Thomas Hochkirchen, David van Bebber: 'Statistical Design of Experiments' Wilhelm Kleppmann: 'Design of Experiments: Optimising Products and Processes'