Aalen University of Applied Sciences

Module handbook

SoSe 26

Master Advanced Systems Design (Systemtechnik) (MSD)
SPO-30

March 9, 2026

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Research module 1

37001

Module Number	37001
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	20
Workload Class	
Workload Self-Study	600
Offered	Winter term, Summer term
Modul Type	mandatory
Language	Deutsch, English
Use in other SG	
Module Duration	1 Semester

Participation Requirements: none

Module Objectives

Course Content: Research paper incl. research report (37101)

- Technical guidance in the respective research topic
- Developing the state of the art and conducting and evaluating literature research
- Guidance on the use of R&D planning tools
- Planning scientific test series
- Scientific experimentation and test evaluation
- Writing a scientific interim project report on your own research topic

research unit (37102):

- Processing, presenting, and target group-oriented presentation of scientific results

Professional Competence: Through the chosen research topic and its treatment, students are able to refer to the state of the art in science and technology and conduct detailed literature research. This enables them to deepen and reflect on their specialist knowledge in the respective field. In addition, they can apply the relevant theoretical principles. By applying experimental and/or simulation activities within their research work, students are able to select and evaluate suitable experimental techniques and simulation methods in order to then adapt them for their purposes. They can distinguish between and operate the relevant devices and machines, including control and measurement technology, simulation methods and tools, as well as procedures and tools for experimental data analysis and evaluation. By conducting preliminary experimental investigations or feasibility studies, students are able to experiment scientifically, i.e., they can plan scientific experiments and carry them out in a reproducible manner. They are able to interpret and evaluate the results obtained and derive the necessary next steps for Research module 2.

Interdisciplinary Competence: Students are able to work in research teams. They are able to contribute their communication skills, teamwork skills, conflict management skills, and assertiveness, as well as respect and tolerance toward other team members. Through the responsible planning and execution of their research work, they are able to act independently and take on responsibility. In addition, students can apply the principles of good scientific practice.

Students can present their results to a larger audience and are able to discuss their findings. They can argue professionally in a discussion and are able to deal with both positive and negative criticism.

By reviewing the state of the art, students are able to apply tools for the efficient implementation and evaluation of literature in a targeted manner, based on their specific research question. Through the planning phase of the research project, they are able to efficiently apply various R&D project planning tools, such as creating a project structure plan including resource planning and planning the timeline of the R&D project, for example in the form of a Gantt chart including deliverables and milestones. Finally, students are able to write a scientific interim report for a more extensive R&D project. In addition, students are able to systematically plan experimental or simulation work. Students can also prepare their findings in a target group-oriented manner, present the scientific results, and engage in scientific discussions.

Literature: none

Type:

- Project work
- Laboratory
- Presentation
- Self-study
- Report

Module Examination

Requirements for Admission to the Module Exam: none

Final grade: 90% research work (PLS) and 10% research presentation (PLR 30)

Auxiliary means: all resources necessary for carrying out the research work.

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37101: Research paper incl. research report *supervising professor*				
20		1	P+L	PLS 90% graded
37102: Research unit *supervising professor*				
		1	S	PLR 30, 10% graded

Comments

Preamble:

Research module 1 (1st semester) and 2 (2nd semester) as well as the master's thesis (3rd semester) build on each other in terms of content and structure.

Students work on a scientific-technical question as part of an independent research project. This takes place in the respective "Research" courses. The research projects conclude with a detailed interim report, which must be defended before the first and second examiners. In the accompanying research seminars, students present their research work to the professors and fellow students of the program at regular intervals in the form of a project review. This takes place in the respective "Research Presentation" courses. This not only gives students practice in presentation techniques, but also in taking responsibility for their research project and the results they achieve. Due to the broad range of topics covered in the program, students also learn the ability to prepare and present their research topic in a way that is understandable, even for non-experts.

Research module 2

37002

Module Number	37002
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	20
Workload Class	
Workload Self-Study	600
Offered	Winter term, Summer term
Modul Type	mandatory
Language	Deutsch, English
Use in other SG	
Module Duration	1 Semester

Participation Requirements: Research module 1

Module Objectives

Course Content: Research paper incl. research report (37201)

- Technical guidance in the respective research topic
- Carrying out experimental/simulation work
- Processing and evaluating results
- Writing an interim scientific project report on your own research topic

Research unit (37202):

- Processing, presenting, and target group-oriented presentation of scientific results

Professional Competence: Students are able to evaluate significant new findings in their respective research topics that clearly go beyond the state of the art. Under the expert guidance of their supervisors and in discussion with the members of their respective research teams, they increasingly develop into experts in their field. They are able to operate experimental equipment, simulation tools, and control and regulation units for conducting experiments and can evaluate the results scientifically. They are able to discuss technical issues with supervisors and members of the respective research team, critically evaluate the results obtained, and, based on this, derive and set up further experiments.

Furthermore, through cross-disciplinary exchanges with students from other disciplines or research areas, students are able to identify connections between different research topics and the findings obtained and use them for their own work.

Interdisciplinary Competence: Students are able to work in research teams. They are able to contribute their communication skills, teamwork skills, conflict management skills, and assertiveness, as well as respect and tolerance toward other team members.

Through the responsible planning and execution of their research work, they are able to act independently and take on responsibility.

Students can systematically carry out their methodological and scientific experiments. They are able to assess structured analyses and evaluations of the scientific results achieved. By preparing the scientific interim report, students deepened their expertise in independently preparing scientific project reports for more extensive R&D projects.

Literature: none

Type:

- Laboratory
- Project work
- Presentation
- Self-study
- Report

Module Examination

Requirements for Admission to the Module Exam: none

Final grade: 90% research work (PLS) and 10% research presentation (PLR 30)

Auxiliary means: all resources necessary for carrying out the research work.

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37201: Research paper incl. research report *supervising professor*				
20		2	P+L	PLS 90% graded
37202: Research unit *supervising professor*				
		2	S	PLR 30, 10% graded

Comments

Preamble:

Research module 2 follows on from Research module 1 in terms of content and includes the following aspects and tasks:

- Carrying out experimental/simulation work
- Processing the results
- Evaluating the results: The central component is the development, processing, and evaluation of the research results, building on the prerequisites established in Research module 1 and the feasibility studies carried out. In the course of the module, it may be necessary to adapt or expand the experimental setups, etc.

The research work is carried out at Aalen University and supervised by the supervising professor.

Project Management

37003

Module Number	37003
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	5
Workload Class	60
Workload Self-Study	90
Offered	Winter term
Modul Type	mandatory
Language	Deutsch, English
Use in other SG	Joint event with the degree program "Advanced Materials and Manufacturing"
Module Duration	1 Semester

Participation Requirements: none

Module Objectives

Course Content: Tools of scientific work:

- Literature and patent research
- Scientific publications
- Presentation and discussion of scientific results
- Good scientific practice

Innovation and R&D project management

- R&D project management: methods, tools, and procedures, e.g., project planning and controlling
- Innovation management: e.g., innovation processes, evaluation and prioritization of innovations/ideas
- Publicly funded projects: e.g., funding landscape, funding guidelines, project application

Professional Competence: General information:

In addition to the research modules and specialist lectures, students acquire skills in the areas of "Management of R&D Projects and Innovations" and "Tools of Scientific Work" through the "Project Management" module. The methods learned are directly applied in Research module 1 and 2 as well as in the master's thesis.

Students can conduct targeted literature and patent searches, evaluate them, and compile and assess them in a clear overview of the state of science and technology. They can reproduce the structure of technical-scientific (project) reports and scientific publications. This enables them to write technical-scientific (project) reports on a larger scale as well as scientific publications. They are also able to compile, present, and discuss scientific results in various forms, e.g., as posters or slide presentations. Students can

select important methods and tools for efficient research work, such as literature and patent research, in a targeted manner and apply them to their specific problem.

Students are able to independently design, plan, and implement extensive R&D projects. They are also able to monitor and evaluate project progress and conduct target group-oriented project reviews. This is based on the methods and tools of R&D project management that they have learned. Similarly, students have the competence to plan innovations and analyze and evaluate innovative ideas in a structured manner, e.g., based on a utility analysis with regard to criteria such as feasibility, unique selling points, or market potential.

Furthermore, they can evaluate topics/projects in terms of their eligibility for funding and identify suitable project sponsors and funding instruments depending on the topic. Students are able to make significant contributions to a promising project application for public funding.

Students are able to select the appropriate methods for their specific problem from a variety of methods for R&D project and innovation management (e.g., cockpit charts for project controlling or utility analysis for evaluating innovation ideas), adapt them specifically if necessary, and apply them in a goal-oriented manner.

Interdisciplinary Competence: Exercises in both submodules are held in small groups and in plenary sessions. This enables students to strengthen their communication skills, teamwork skills, conflict management skills, and assertiveness, as well as their respect and tolerance towards others. In addition, they are able to present confidently in front of a larger audience and engage in critical discussion.

Literature:

- Wissenschaftliches Arbeiten: Methodenwissen für Wirtschafts-, Ingenieur- und Sozialwissenschaftler von Bernd Heesen | 8. Mai 2021
- Scientific Writing in Engineering von Kosmas Dragos & Kay Smarsly
- A Scientific Approach to Writing for Engineers and Scientists von Robert E. Berger

Type:

- Lecture
- Excercise
- Project work
- Self-study

Module Examination

Requirements for Admission to the Module Exam: none

Final grade: PLR 30

Auxiliary means: Further information will be provided by the instructors.

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37103: Tools of scientific work *Prof. Dr. Markus Glaser*				
5	2	1 or 2	V+Ü	PLR 30, graded
37104: Innovation and R&D project management *Prof. Dr. Markus Glaser*				
	2	1 or 2	V+P	

Comments

none

Elective module 1

Module Number	37004
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	5
Workload Class	Depending on the module chosen
Workload Self-Study	150
Offered	Winter term, Summer term
Modul Type	Elective
Language	Depending on the module chosen
Use in other SG	
Module Duration	1 Semester

Participation Requirements: Depending on the module chosen

Module Objectives

Course Content: The elective modules must be selected from the range of master's lectures offered by Aalen University. Students must coordinate their elective lectures with their supervising professor. Final approval of the elective modules is granted by the examination board.

Professional Competence: Students have the opportunity to set their own priorities and develop an individual skills profile. For subject-specific skills, see the respective module description.

Interdisciplinary Competence: Students independently expand the compulsory content of their studies with a view to acquiring meaningful overall qualifications that match their interests.

Literature: Depending on the module chosen

Type:

- Depending on the module chosen

Module Examination

Requirements for Admission to the Module Exam: Depending on the module chosen

Final grade: Depending on the module chosen

Auxiliary means: Depending on the module chosen

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37105: Elective module 1 *Depending on the module chosen*				
5		1 or 2	Depending on the module chosen	Depending on the module chosen

Comments

Elective module 1 (37004) must be chosen in addition to 37003 (Project Management). Depending on when they start their studies (summer or winter semester), students take part in the course either in their first or second semester.

Elective module 2

Module Number	37005
Module Manager	Prof. Dr. Heinrich Steinhart
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Credits	5
Workload Class	Depending on the module chosen
Workload Self-Study	150
Offered	Winter term, Summer term
Modul Type	Elective
Language	Depending on the module chosen
Use in other SG	
Module Duration	1 Semester

Participation Requirements: Depending on the module chosen

Module Objectives

Course Content: The elective modules must be selected from the range of master's lectures offered by Aalen University. Students must coordinate their elective lectures with their supervising professor. Final approval of the elective modules is granted by the examination board.

Professional Competence: Students have the opportunity to set their own priorities and develop an individual skills profile. For subject-specific skills, see the respective module description.

Interdisciplinary Competence: Students independently expand the compulsory content of their studies with a view to acquiring meaningful overall qualifications that match their interests.

Literature: Depending on the module chosen

Type:

- Depending on the module chosen

Module Examination

Requirements for Admission to the Module Exam: Depending on the module chosen

Final grade: Depending on the module chosen

Auxiliary means: Depending on the module chosen

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37106: Elective module 2 *Depending on the module chosen*				
5		1	Depending on the module chosen	Depending on the module chosen

Comments

Depending on the module chosen

Elective module 3

37006

Module Number	37006
Module Manager	Prof. Dr. Heinrich Steinhart
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Credits	5
Workload Class	Depending on the module chosen
Workload Self-Study	150
Offered	Winter term, Summer term
Modul Type	Elective
Language	Depending on the module chosen
Use in other SG	
Module Duration	1 Semester

Participation Requirements: Depending on the module chosen

Module Objectives

Course Content: The elective modules must be selected from the range of master's lectures offered by Aalen University. Students must coordinate their elective lectures with their supervising professor. Final approval of the elective modules is granted by the examination board.

Professional Competence: Students have the opportunity to set their own priorities and develop an individual skills profile. For subject-specific skills, see the respective module description.

Interdisciplinary Competence: Students independently expand the compulsory content of their studies with a view to acquiring meaningful overall qualifications that match their interests.

Literature: Depending on the module chosen

Type:

- Depending on the module chosen

Module Examination

Requirements for Admission to the Module Exam: Depending on the module chosen

Final grade: Depending on the module chosen

Auxiliary means: Depending on the module chosen

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37107: Elective module 3 *Depending on the module chosen*				
5		2	Depending on the module chosen	Depending on the module chosen

Comments

Depending on the module chosen

General studies

37999

Module Number	37999
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	1
Workload Class	Depending on the chosen events
Workload Self-Study	30
Offered	Winter term, Summer term
Modul Type	mandatory
Language	Deutsch, English
Use in other SG	
Module Duration	1 Semester

Participation Requirements: none

Module Objectives

Course Content: Various courses are offered as part of the general studies program. Each semester has a different thematic focus. The respective course content is flexible and can therefore be found in the Studium Generale program for each semester.

Students can attend the courses at any point during their studies, but no later than in their final semester.

To receive credit for the corresponding hours and credit points, a summary sheet of the workload completed and a written report on the events attended must be submitted. Alternatively, voluntary or civic engagement during the course of study can be documented and credited. Relevant information can be found in the "Aalen University Guidelines on the general studies and the Acquisition of Social Competence".

Professional Competence: The courses offered as part of the general studies program promote the holistic education of students. The courses complement the respective subject studies with interdisciplinary topics.

The courses enable students to engage with fundamental scientific topics and current issues. Students acquire key qualifications that are important for their future careers. In order to strengthen students' social skills, volunteer work is encouraged.

Students can present complex interdisciplinary topics and classify their interrelationships. They are able to independently address socio-political issues.

Interdisciplinary Competence: Depending on the courses they choose, students strengthen their teamwork skills, improve their time management and/or conflict management skills, or deepen their presentation skills. Students are able to apply the skills they have acquired in a targeted manner. Students recognize the importance of volunteer work for personal development and for society.

Literature: Depending on the event

Type:

Module Examination

Requirements for Admission to the Module Exam: none

Final grade: Students prepare a comprehensive report (PLS) on the events and activities they have attended.

Auxiliary means:

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
37999: Various events offered by the Career Center and the degree programs. *Can be found in the semester program*				
1				PLS ungraded

Comments

none

Master thesis

9999

Module Number	9999
Module Manager	Prof. Dr. Heinrich Steinhart
E-Mail	heinrich.steinhart@hs-aalen.de
Credits	29
Workload Class	60
Workload Self-Study	810
Offered	Winter term, Summer term
Modul Type	mandatory
Language	Deutsch, English
Use in other SG	
Module Duration	1 Semester

Participation Requirements: Completed Research module 1 and 2

Module Objectives

Course Content: • Independent scientific work
• Scientific publishing
• Engineering-based scientific approaches to solving complex technical tasks and problems

Professional Competence: General information:
The master's thesis builds on Research module 1 and 2 (see also module description there). In the master's thesis, students present a scientific topic independently and coherently. In doing so, they apply the subject-specific and methodological skills acquired during their master's program in a targeted manner. In the context of the research results of the master's thesis, this also includes writing an academic publication or a version of an academic publication that is ready for submission, or alternatively, a significant contribution to a project proposal for a typically publicly funded R&D project.

In a final colloquium open to the university community, students present the core theses and findings of their master's thesis to those directly involved and interested parties and defend their work.

Students are able to discuss their research results critically from an academic perspective and relate them to the state of the art in technology and science. They are able to verify and, if necessary, falsify their working hypotheses and, based on this, plan, implement, and evaluate further experimental and/or simulation studies. In combination with the results obtained in Research module 1 and 2, students are able to discuss their entire work holistically against the background of the state of the art in technology and science and present it in a coherent form in writing (in their master's thesis) and as a

presentation (for the defense of their work). Furthermore, they have the competence to summarize the most important results and contributions to the discussion in the form of a publishable version of a scientific publication.

Interdisciplinary Competence: Students improve their social skills through intensive communication with their supervisors, other members of the respective research group, and fellow students on the program. They also increase their competence in presenting to larger audiences and in scientific discussion. This includes confident presentation skills and the ability to accept criticism.

Students can apply working methods that are tailored to the specific task at hand. They are able to apply project management methods in a goal-oriented manner. They are also able to present the results of larger projects in report, publication, and presentation form in a manner tailored to the target audience.

Literature: Specific to the respective topic of the master's thesis. Further information will be provided by the instructor.

Type:

- Laboratory
- Project work
- Presentation
- Self-study
- Report

Module Examination

Requirements for Admission to the Module Exam: none

Final grade: 80% written thesis (PLS), 20% defense (PLR 30)

Auxiliary means: everything

Included Courses

CP	SWS	Semester	Type	Type and Duration of Proof of Performance
9999: Research master thesis incl. defense *professors of the degree program*				
29		3		PLS 80% graded and PLR 30 20% graded

Comments

Students are supervised by two supervisors, whereby the primary supervisor is always a professor from the degree program, while the secondary supervisor may be from another university, research institution, or industry. The secondary supervisor must have at least a doctorate.

Two hours per week are allocated for contact time with the supervising professor for experiment planning, discussion/evaluation of results, and preparation of presentations/publications. This amounts to approximately 60 hours over the 6-month duration of the master's thesis. In addition, research assistants (e.g., doctoral students, postdocs) working with the supervising professor are available to students as contact persons and discussion partners.