HOCHSCHULE HEILBRONN

Bachelor's degree programme:
Electrical Systems Engineering (ESE-B)

The following study and examination regulations (in German "SPO") were verified and approved by the Senate at its 454th meeting on 30 April 2025.

Only the German version of this document is legally binding!

Prof. Dr. Ulrich Brecht
Prorector for Learning and Teaching

§ 47

Bachelor's programme in
Electrical Systems Engineering (ESE-B)

1 Basics of the programme structure

1.1 Total scope

The total scope of the compulsory and compulsory elective courses required for successful completion of the programme is **129** semester hours per week and leads to the acquisition of **210** ECTS credits.

1.2 Structure of the degree programme

The compulsory courses required for successful completion of the programme and the associated examinations and preliminary examination requirements are listed in Tables 2.1 and 2.3 and in Table 3. The courses are assigned to individual modules, which are awarded ECTS credits.

1.3 Language of instruction

All courses are held in either German or English (§3 (5), SPO AT Bachelor 7sem).

1.4 Basic studies in German or English

Depending on admission, the basic studies must be completed in either German or English.

2 Basic studies

2.1 Basic studies in German

2.1.1 Subjects in German

The courses in the basic studies are listed in Table 2.1.

Table 2.1: Basic studies in German[1]

Semester	Course					Examination		Prerequisite		ECTS
	Module	No	Course title	Type	SWS	Type	Duration	Type	Duration	
1	G1	**605010**	**Mathematics 1**			LK	90			
		605011	Mathematics 1	V/Ü	6	Module examination				5
	G3	**605030**	**Physics**			LK	90			
		605031	Physics	V/Ü	4	Module examination				5
	G4	**605040**	**Computer Science 1**			LK	90			
		605041	Computer Science 1	V/L	4	Module examination				5
	G6	**605060**	**Electrical Engineering 1**			LK	90			
		605061	Electrical Engineering 1	V/Ü	4	Module examination				5
	G9	**605090**	**Electronic circuit technology 1**			LK	120			
		605091	Electronic Circuit Technology 1	V/Ü	4	Module examination				5
	G11	**605110**	**Digital technology with laboratory**					SK	60	
		605111	Digital Technology with Laboratory	V/L	4			Module examination		5
Total 1st semester					**26**	**5**		**1**		**30**
2	G2	**605020**	**Mathematics 2**			LK	120			
		605021	Mathematics 2	V/Ü	4	Module examination				5
	G5	**605050**	**Computer Science 2**			LK	120			
		605051	Computer Science 2	V/L	4	Module examination				5
	G7	**605070**	**Electrical engineering 2**			LK	90			
		605071	Electrical Engineering 2	V/Ü	4	Module examination				5
	G8	**605080**	**Physics and Electronics Laboratory**							
		605081	Physics Laboratory	L	2			SL		2,5
		605082	Laboratory for Electronic Circuit Technology	L	2			SL		2,5
	G10	**605100**	**Electronic Circuit Technology 2**			LK	120			
		605101	Electronic Circuit Technology 2	V/Ü	4	Module examination				5
	G12	**605120**	**Computer architecture**			LK	90			
		605121	Computer architecture	V/Ü	4	Module examination				5
Total 2nd semester					**24**	**5**		**2**		**30**

[1] See https://cdn.hs-heilbronn.de/ff7396326d75e064/21b0725bd705/2014-05-04-SPO-AT-Bachelor_ENGLISCH.pdf page 26 for abbreviations

2.1.2 Module examinations of the German basic studies

The module examinations of the basic studies are listed in Table 2.2:

Table 2.2: Module examinations of the Bachelor's preliminary examination, Weighting of the grades for the individual examination components and module grades

Module grades for the basic study programme: Electrical Systems Engineering (ESE)					
Module	**No**	**Module name**			**Weighting of the module grade for the grade according to § 22**
		Examination	**No**	**Prerequisite**	
Mathematical and scientific fundamentals					
G1	**60501**	**Mathematics 1**			**5**
	605011	Mathematics 1			
G2	**605020**	**Mathematics 2**			**5**
	605021	Mathematics 2			
G3	**605030**	**Physics**			**5**
	605031	Physics			
Computer science					
G4	**605040**	**Computer science 1**			**5**
	605041	Computer Science 1			
G5	**605050**	**Computer Science 2**			**5**
	605051	Computer Science 2			
Electrical Engineering and Electronics					
G6	**605060**	**Electrical Engineering 1**			**5**
	605061	Electrical Engineering 1			
G7	**605070**	**Electrical Engineering 2**			**5**
	605071	Electrical Engineering 2			
G8	**605080**	**Physics and Electronics Laboratory**			**0**
			605081	Physics laboratory	
			605082	Electronic Circuit Engineering Laboratory	
G9	**605090**	**Electronic Circuit Technology 1**			**5**
	605091	Electronic Circuit Technology 1			
G10	**605100**	**Electronic Circuit Technology 2**			**5**
	605101	Electronic Circuit Technology 2			
Information Technology					
G11	**605110**	**Digital Technology with Laboratory**			**0**
			605111	Digital Technology with Laboratory	
G12	**605120**	**Computer Architecture**			**5**
	605121	Computer architecture			
Total					**50**

2.1.3 Admission requirements

The following admission requirements apply:

To participate in *605081 Physics Laboratory, 605031 Physics* must have been passed with a grade of 4.0 or better.
To participate in *605082 Laboratory Electronic Circuit Technology, 605091 Electronic Circuit Technology 1* must be passed with a grade of 4.0 or better.

2.2 Basic studies in English

2.2.1 Subjects in English

The courses in the basic studies in English are listed in Table 2.3.

Table 2.3: Basic studies in English

Semester	Course					Examination		Prerequisite		ECTS
	Module	No	Course title	Type	SWS	Type	Duration	Type	Duration	
1	G1	**605510**	**Mathematics 1**			LK	90			
		605511	Mathematics 1	V/Ü	6	Module examination				5
	G3	**605530**	**Physics**			LKBK	90			
		605531	Physics	V/Ü	4	Module examination				5
	G4	**605540**	**Electrical Engineering and Electronics 1**			LK	90			
		605541	Electrical Engineering and Electronics 1	V/Ü	4	Module examination				5
	G6	**605560**	**Programming 1**			LK	90			
		605561	Programming 1	V/L	4	Module examination				5
	G8	**605580**	**Engineering Mechanics 1**			Advanced	60			
		605581	Engineering Mechanics 1	V/Ü	4	Module examination				5
	G11	**605610**	**German Language and Academic Skills 1** [1)]			LP				
		605611	German Language and Academic Skills 1	V/S	4	Module examination				5
Total 1st semester					**26**	**6**		**0**		**30**
2	G2	**605520**	**Mathematics 2**			LK	120			
		605521	Mathematics 2	V/Ü	4	Module examination				5
	G5	**605550**	**Electrical Engineering and Electronics 2**							
		605551	Electrical Engineering and Electronics 2	V/Ü	2	LK	90			2.5
		605552	Lab Electrical Engineering	L/S	2			SL		2.5
	G7	**605570**	**Programming 2**			LK	120			
		605571	Programming 2	V/L	4	Module examination				5
	G9	**605590**	**Engineering Mechanics 2 and 3**			PK	120			
		605591	Engineering Mechanics 2	V/Ü	2	Module examination				2.5
		605592	Engineering Mechanics 3	V/Ü	2	Module examination				2.5
	G10	**605600**	**Circuit design**			LK	60			
		605601	Circuit design	V/Ü	4	Module examination				5
	G12	**605620**	**German Language and Academic Skills 2** [2)]			LP				
		605621	German Language and Academic Skills 2	V/S	4	Module examination				5
Total 2nd semester					**24**	**6**		**1**		**30**

[1] *605610 German Language and Academic Skills 1*: Written and oral knowledge of German at level B1, proven by a written examination (with an oral component if applicable), e.g. telc B1, Goethe Certificate B1, DSD I or equivalent

[2] *605620 German Language and Academic Skills 2*: Written and oral knowledge of German at level B2, proven by a written examination (with an oral part if necessary), e.g. telc B2, Goethe Certificate B2, DSD II, TestDaF 3, DSH 1 or equivalent; see also point 3.5

2.2.2 Module examinations of the basic English course

The module examinations of the basic studies are listed in Table 2.4:

Table 2.4: Module examinations of the Bachelor's preliminary examination, Weighting of the grades for the individual examination components and module grades

Module grades for the basic studies in English: Electrical Systems Engineering (ESE)

Module	No	Module			Weighting of the module grade for the grade in accordance with § 22
		Examination	No	Prerequisite	
Mathematics and Physics					
G1	**605510**	**Mathematics 1**			**5**
	605511	Mathematics 1			
G2	**605520**	**Mathematics 2**			**5**
	605521	Mathematics 2			
G3	**605530**	**Physics**			**5**
	605531	Physics			
Electrical Engineering					
G4	**605540**	**Electrical Engineering and Electronics 1**			**5**
	605541	Electrical Engineering and Electronics 1			
G5	**605550**	**Electrical Engineering and Electronics 2**			**5**
	605551	Electrical Engineering and Electronics 2			
			605552	Electrical Engineering Laboratory	
Programming					
G6	**605560**	**Programming 1**			**5**
	605561	Programming 1			
G7	**605570**	**Programming 2**			**5**
	605571	Programming 2			
Engineering Mechanics					
G8	**605580**	**Engineering Mechanics 1**			**5**
	605581	Engineering Mechanics 1			
G9	**605590**	**Engineering Mechanics 2 and 3**			**5**
	605591	Engineering Mechanics 2			
	605592	Engineering Mechanics 3			
G10	**605600**	**Circuit Design**			**5**
	605601	Circuit Design			
German and Academic Skills					
G11	**605610**	**German Language and Academic Skills 1**			**5**
	605611	German Language and Academic Skills 1			
G12	**605620**	**German Language and Academic Skills 2**			**5**
	605621	German Language and Academic Skills 2			
Total					**60**

2.2.3 Admission requirements

To participate in 605550 *Electrical Engineering and Electronics 2,* 605540 *Electrical Engineering and Electronics 1* must have been passed.

2.3 Bachelor's preliminary examination

The preliminary examination for the German and English basic studies comprises the module grades for all modules listed in Table 2.2 (German) or Table 2.4 (English). If several performance assessments take place at course level within a module, the module grade is determined according to a weighted arithmetic mean of the individual performances contained in the module in accordance with the ECTS. The overall grade for the preliminary Bachelor's examination is calculated as the weighted arithmetic mean of the module grades, with the weights for the individual grades being determined on the basis of the ECTS credits listed in Table 2.2 (German) or Table 2.4 (English).

3 Main studies

3.1 Subject

The courses in the main study programme are listed in Table 3.

Table 3: Subjects in the main study period

Semester	Course					Examination		Prerequisite		ECTS
	Module	No	Course title	Type	SWS	Type	Duration	Type	Duration	
3	H1	**605210**	**Mathematics 3**			LK	120			
		605211	Mathematics 3	V/Ü	4	Module examination				5
	H2	**605220**	**Signals and systems**			LK	120			
		605221	Signals and Systems	V/Ü	4	Module examination				5
	H4	**605240**	**Microcontrollers with laboratory** 1)			LKBK	90			
		605241	Microcontroller with laboratory	V/L	4	Module examination				5
	H5	**605250**	**Introduction to AI**			LKBK	90			
		605251	Introduction to AI	V/Ü	4	Module examination				5
	H7	**605270**	**Measurement Technology and Sensor Technology**			LP				
		605271	Measurement Technology and Sensor Technology	V/Ü	4	Module examination				5
	H10	**605300**	**Electrical drive systems**			LK	120			
		605301	Electrical drive systems	V/Ü	4	Module examination				5
Total 3rd semester					**24**	**6**		**0**		**30**
4	H6	**605260**	**Industrial Network of Things**			LK	90			
	H8	605261	Fundamentals of Network Technology	V/Ü	2	Module examination				2.5
		605262	Networked systems	V/Ü	2	Module examination				2.5
		605280	**Control engineering**			LK	120			
		605281	Control engineering	V/Ü	4	Module examination				5
	H9	**605290**	**Laboratory for Measurement and Control Technology**							
		605291	Laboratory for Measurement Technology	L/S	2	LL				2.5
		605292	Laboratory control engineering	L/S	2			SL		2.5
	H11	**605310**	**Electromagnetism and high-frequency technology**			LK	120			
		605311	Electromagnetism and High Frequency Technology	V/Ü	4	Module examination				5

	H1	**605320**	**Circuit development, layout and simulation**			LA					
		605321	Circuit Development Layout and Simulation	V/Ü	4	Module examination					5
	H1	**605340**	**Specialisation 1**								
			Elective subject(s) in accordance with section 3.2		4	Lx					5
Total 4th semester					**24**	**6**		**1**			**30**

5	**H19**	**605390**	**Practical study semester**								
		605391	Supervised practical phase		0			SA			2
		605392	Colloquium on the practical study semester	S	0			SR			4
Total 5th semester					**0**	**0**		**2**			**30**

6	**H3**	**605230**	**Digital signal processing**			LK	90				
		605231	Digital Signal Processing	V/Ü	4	Module examination					5
	H1	**605330**	**Signal transmission+ EMC**			LK	120				
		605331	+ e EMC signal transmission	V/Ü	4	Module test					5
	H15	**605350**	**Specialisation 2**								
			Elective subject(s) in accordance with section 3.2		4	Lx					5
	H1	**605360**	**Specialisation 3**								
			Elective subject(s) in accordance with section 3.2		4	Lx					5
	H2	**605400**	**Ethics**			LR					
		605401	Ethics	V/Ü	2	Module examination					2.5
	H2	**605410**	**Seminar paper**			LE					
		605411	Seminar paper	L/S	1	Module examination					7.5
Total 6th semester					**19**	**6**		**0**			**30**

7	**H17**	**605370**	**Specialist consolidation 4**								
			Elective subject(s) in accordance with section 3.2		4	Lx					5
	H1	**605380**	**Specialisation 5**								
			Elective subject(s) in accordance with section 3.2		4	Lx					5
	H2	**605420**	**Systems Engineering - Management and Accounting**			LP					
		605421	Systems Engineering and Management	V/Ü	2	Module examination					2.5
		605422	Accounting	V/Ü	2	Module examination					2.5
	H23	**605430**	**Bachelor thesis / project**								
		605431	Project planning and colloquium	S	0	PA					3
		605432	Bachelor thesis		0	PB					12
Total 7th semester					**12**	**5**		**0**			**30**

[1] The course 605241 *Microcontrollers with Laboratory* builds on the course 605111 *Digital Technology with Laboratory*. Students in the English basic programme should therefore take the course 605111 *Digital Technology with Laboratory* from the VF catalogue in the 3rd semester instead of 605241 *Microcontrollers with Laboratory*. In this case, the course 605121 *Microcontrollers with Laboratory* is taken in accordance with section 3.2 in module 605340 *Specialisation 1* from the VF catalogue.

3.2 Electives

To fulfil the **examination requirements for "Specialisation 1-2"**, students select technical electives totalling 10 ECTS from the VF catalogue, with the exception of [(1)]. To fulfil the **examination requirements for "Specialisation 3-5",** technical electives totalling 15 ECTS must be selected from the VF catalogue or the WF catalogue.

Students in **the English basic study programme** must enrol in the subject 605121 *Microcontrollers with Laboratory* from the VF catalogue in module 605340 *Specialisation 1*.

The courses listed in the VF and WF catalogues are designed to enable students to deepen their studies. Students can choose areas of specialisation by successfully completing the elective courses assigned to the respective area of specialisation. The assignment of each elective course to one or more areas of specialisation is indicated in the VF and WF catalogues and in the module handbook. Selected areas of specialisation can be indicated on the transcript.

The VF and WF catalogues are part of the module handbook and are available on the programme homepage and the official digital learning platform of the university by the end of the previous semester at the latest. Subjects from other programmes outside the Heilbronn University faculty or from other universities may be recognised upon request. Participation in elective courses may be limited due to capacity reasons.

Changes to the VF and WF catalogues are approved by the examination board upon request of the lecturer responsible for the course in question, after consultation with the faculty council and the study commission. The subjects offered must take into account the competence objectives of the degree programme and must correspond to at least level 6 of the German Qualifications Framework. Multiple credits for subjects are not permitted.

[1] If a total of 20 ECTS credits are selected for technical electives **at another university**, only 5 ECTS credits are required from the VF catalogue.

3.3 Module examinations in the main study period

The module examinations of the Bachelor's examination, the associated examination requirements and prerequisites, as well as the weighting of the grades for the individual examination requirements and the module grades and the Bachelor's thesis are shown in **Table 4**.

Table 4: Module examinations for the Bachelor's examination, weighting of the grades for the individual examination components and module grades

Module grades for the main study programme: Electrical Systems Engineering (ESE)					
Module	**No**	**Module**			**Weighting of the module grade for the grade according to § 29**
		Examination	**No.**	**Prerequisite**	
Mathematical methods					
H1	**605210**	**Mathematics 3**			**5**
	605211	Mathematics 3			
H2	**605220**	**Signals and Systems**			**5**
	605221	Signals and Systems			
H3	**605230**	**Digital Signal Processing**			**5**
	605231	Digital Signal Processing			
Information technology					
H4	**605240**	**Microcontrollers with laboratory**			**5**
	605241	Microcontroller with laboratory			
H5	**605250**	**Introduction to AI**			**5**
	605251	Introduction to AI			
H6	**605260**	**Industrial Network of Things**			**5**
	605261	Fundamentals of Network Technology			
	605262	Networked Systems			
Measurement and control technology					

H7	**605270**	**Measurement technology and sensor technology**			**5**
	605271	Measurement technology and sensor technology			
H8	**605280**	**Control engineering**			**5**
	605281	Control engineering			
H9	**605290**	**Laboratory for Measurement and Control Engineering**			**5**
	605291	Laboratory for Measurement Technology			
			605292	Laboratory Control Engineering	
Electrical engineering					
H10	**605300**	**Electrical drive systems**			**5**
	605301	Electrical drive systems			
H11	**605310**	**Electromagnetism and high-frequency technology**			**5**
	605311	Electromagnetism and High Frequency Technology			
H12	**605320**	**Circuit Development Layout and Simulation**			**5**
	605321	Circuit Development Layout and Simulation			
H13	**605330**	**Signal transmission+ EMC**			**5**
	605331	Signal transmission + EMC			
Elective					
H14	**605340**	**Specialisation 1**			**5**
		Elective subject(s) in accordance with section 3.2			
H15	**605350**	**Specialisation 2**			**5**
		Elective subject(s) in accordance with section 3.2			
H16	**605360**	**Specialisation 3**			**5**
		Elective subject(s) in accordance with section 3.2			
H17	**605370**	**Specialisation 4**			**5**
		Elective subject(s) in accordance with section 3.2			
H18	**605380**	**Specialisation 5**			**5**
		Elective subject(s) in accordance with section 3.2			
Practical study semester					
H19	**605390**	**Practical study semester**			**0**
			605391	Supervised practical phase	
			605392	Colloquium on the practical study semester	
Technical management and project work					
H20	**605**	**Ethics**			**2.5**
	605401	Ethics			
H21	**605410**	**Seminar paper**			**7.5**
	605411	Seminar paper			
H22	**605420**	**Systems Engineering - Management and Accounting**			**5**
	605421	Systems Engineering and Management			
	605422	Accounting			
H23	**605430**	**Bachelor's thesis / project**			**15**
	605431	Project planning and colloquium			
	605432	Bachelor thesis			
Total					**120**

3.4 Bachelor's examination

The Bachelor's certificate contains the module grades for all modules listed in Table 4 and the Bachelor's thesis. If several performance assessments take place at course level within a module (including compulsory elective modules), the module grade is determined according to a weighted arithmetic mean of the individual performances contained in the module in accordance with the ECTS. The overall grade on the Bachelor's certificate is calculated as the weighted arithmetic mean of the module grades and the grade for the Bachelor's thesis, with the weights for the individual grades being determined on the basis of the ECTS credits listed in Table 4.

3.5 Admission requirements

The following admission requirements apply:

The admission requirement for admission to the German-language main **study programme with a foundation course in English is that module *605620 German Language and Academic Skills 2*** has been passed at minimum language level B2 or equivalent. Proof of this must be provided by submitting one of the following certificates: DSH-1, Goethe B2, telc B2 (or comparable tests in accordance with the framework regulations for German language tests for studying at German universities. Passing the corresponding GER course level of a DaF course at the Centre for Studies and Teaching at Heilbronn University is also accepted as equivalent proof.

To participate in *605292 Laboratory Control Engineering*, *605221 Signals and Systems* must have been passed.

To participate in *605291 Laboratory Measurement Technology*, *605271 Measurement Technology and Sensor Technology* must have been passed.

Before the Bachelor's thesis can be issued, the practical study semester must have been completed and the compulsory examinations of the 3rd and 4th semesters must have been passed.

3.6 Practical study semester

The requirements for crediting the practical study semester and the office responsible for crediting are regulated in the general section of these study and examination regulations (§§ 4, 7 para. 2).

During the practical study semester, students should apply the knowledge they have acquired so far in a supervised practical phase. In doing so, they should carry out engineering or information technology tasks independently and with shared responsibility.

A practical semester abroad is expressly desired.

3.7 Special regulations for Studium-PLUS models during the contract period between the cooperation company and the student

As part of their studies, Studium-Plus students are required to complete additional practical work at their partner company during lecture-free and exam-free periods that are not used for statutory holiday entitlement. During these periods, the specialist knowledge acquired to date is applied and deepened in practice, and students gain an in-depth understanding of the working conditions and methods of engineers.

Their engineering-related activities include working as independently and responsibly as possible, as well as working on and solving specific problems in the following possible areas:

- Development
- Laboratory, testing and test field
- Design and standardisation
- Production planning and control
- Production and assembly
- Quality assurance
- Project planning
- Technical sales
- or other relevant areas.

The focus is based on the company's capabilities and the content of the degree programme.

The level of the activities must be adapted to the individual progress of the course so that the course content can be learned, applied and consolidated through in-depth practical knowledge.

4 Entry into force

These study and examination regulations (SPO 2) shall enter into force on 1 September 2025. Students who have already commenced their studies at the time of entry into force of these study and examination regulations shall complete the remaining examination requirements and preliminary examination requirements in accordance with the previous study and examination regulations (SPO 1).

Heilbronn, 30 April 2025

Signed:

Prof. Dr.-Ing. Oliver Lenzen
Rector

Announcement

The examination regulations are hereby publicly announced in accordance with the announcement regulations of Heilbronn University of Applied Sciences dated 28 June 2017.

Heilbronn, 30 April 2025

For the Prorectorate for Learning and Teaching

Signed
Prof. Dr. Ulrich Brecht