

**Degree Program and Examination Regulations for the
Bachelor's and
Master's degree program in Electromobility ACES at the
Faculty of Engineering at Friedrich-Alexander-Universität
Erlangen-Nürnberg (FAU)
– FPO ACES –
Dated April 6, 2022**

Based on Section 13 (1)(2), Section 43 (5), Section 58 (1) and Section 61 (2)(1) of the Bavarian Higher Education Act (Bayerisches Hochschulgesetz, **BayHSchG**), FAU enacts the following degree program and examination regulations:

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Part I: General Provisions

Section 35 Scope

The degree program and examination regulations for the Bachelor's and consecutive Master's degree programs in Electromobility ACES complement the currently valid General Examination Regulations for Bachelor's and Master's degree programs at the Faculty of Engineering at FAU – **ABMPO/TechFak**.

Section 36 Bachelor's Degree Program, Start of Studies, Related Degree Programs

(1) During the Bachelor's degree program in Electromobility ACES, students acquire skills in the core subjects of engineering, engineering mathematics and in a selection of the following areas:

1. AI and autonomous driving
2. Connectivity
3. E-powertrain
4. Sustainable mobility and production technology.

(2) The Bachelor's degree program shall cover the modules listed in **Appendix 1**.

(3) The degree program shall start in the winter semester.

(4) ¹The following Bachelor's degree programs are considered subject-related degree programs within the meaning of Section 24 (1)(2)(2) **ABMPO/TechFak**:

1. Mechanical Engineering
2. Mechatronics
3. Industrial Engineering
4. International Production Engineering and Management
5. Technical Vocational Education and Training.

²In justified cases, the Degree Program Committee may allow exceptions from sentence 1.

Section 37 Master's Degree Program, Standard Duration of Studies, Start of Degree Program, Related Degree Programs, Teaching and Examination Language

(1) ¹The Master's degree program builds on the content of the Bachelor's degree program. ²Section 36 (1) shall apply accordingly with the proviso that existing skills are extended and built upon accordingly.

(2) The Master's degree program shall comprise the modules in **Appendix 2a** (full-time degree program) or **2b** (part-time degree program).

(3) ¹Students can commence the degree program in either the winter semester or the summer semester. ²Any exceptions are decided by the admissions committee.

(4) The provisions in Section 30 (3)(2) **ABMPO/TechFak** do not apply to related degree programs.

(5) ¹The teaching and examination language shall be governed by Section 4 (4) **ABMPO/TechFak**. ²In addition to modules in German, a sufficient number of modules will be offered in English in each of the specializations on offer in order to allow students to study entirely in English if they wish. ³If the degree program is studied entirely in English, the project report and Master's thesis shall also be written in English; any exceptions shall require the approval of the Degree Program Committee. ⁴It is strongly recommended that only those students who submit proof of proficiency in English with their application for a place on the degree program pursuant to Section 45 take modules in English; the same shall apply accordingly to modules in German.

Part II: Special Provisions

1. Bachelor's Examination

Section 38 Scope of the Grundlagen- und Orientierungsprüfung

The Grundlagen- und Orientierungsprüfung (GOP) includes the modules marked 'GOP' in **Appendix 1**.

Section 39 Scope and Structure of the Bachelor's Examination

¹The Bachelor's examination comprises the modules in **Appendix 1** amounting to 180 ECTS credits. ²The relevant **Appendix** also states the type and scope of examinations, unless stipulated otherwise in the following paragraphs.

Section 40 Specialization Modules

(1) ¹Bachelor's students shall choose two specializations in order to establish a subject-specific profile. ²The skills listed in **Appendix 3** shall be acquired. ³The specialization modules offered within the two chosen specializations are stated in the catalog of specialization modules approved by the Degree Program Committee and are announced in accordance with local practice in the module handbook before the lecture period begins.

(2) ¹The first learning outcome of these modules is to allow students to choose the areas they intend to specialize in pursuant to Section 36 (1). ²The second learning outcome has a research focus, with students learning methods of research applicable to their subject and exploring their subject in more depth to Bachelor's degree level. ³Thirdly, the element of choice allows students to tailor their profile in view of their career plans. ⁴The type and scope of examinations depend on the skills taught in the relevant modules (generally worth 5 ECTS credits) pursuant to sentences 1 to 3 and (2) as well as the module handbook.

(3) ¹One examination achievement is stipulated per module. ²Examinations in the modules shall take one of the following forms: written examination (60, 90, 120 min), oral examination (20–30 min), seminar achievement, tutorial achievement or practical achievement pursuant to Section 6(3) **ABMPO/TechFak**. ³ Section 6 (2)(3) **ABMPO/TechFak** stipulates that in justified exceptional circumstances, combinations of the individual achievements stated in sentence 7 may also be possible. ⁴Other examination forms are possible if so decided by the Degree Program Committee.

(4) ¹The specialization modules are generally worth 5 ECTS credits (typically lecture and tutorial). ²Any exceptions to the size of the module and combinations of teaching units are detailed in the module handbook.

(5) The Degree Program Committee can approve other specializations and modules pursuant to (1) upon request.

Section 41 Elective Modules, Practical Internship

(1) ¹The elective modules worth the minimum number of ECTS credits pursuant to **Appendix 1** should tie in with the specialization modules pursuant to Section 40 (1) and shall be chosen from the catalog recommended by the Degree Program Commit-

tee, that also stipulates the form of the examination to be taken in the module. ²Modules not listed in the catalog must be approved by the Degree Program Committee. ³One examination achievement is stipulated per module. ⁴Section 40 (3) and (4) shall apply accordingly.

(2) The practical internship (B22) shall be completed in accordance with the general guidelines for practical training in Bachelor's and Master's degree programs in Electromobility ACES and must be recognized by the Electromobility ACES Internship Office.

Section 42 Requirements for Admission to Bachelor's Thesis

¹The sixth semester is recommended for completing the Bachelor's thesis. ²Admission to the Bachelor's thesis shall be governed by Section 27 (3)(2) **ABMPO/TechFak**.

Section 43 Bachelor's Thesis

(1) ¹The Bachelor's thesis is intended to train and prove the student's ability to work independently on tasks relating to electromobility ACES. ²Requirements for the thesis shall be such that it can be completed within approximately 300 hours.

(2) ¹The Bachelor's thesis shall deal with an academic topic from one of the chosen areas of specialization. (2) ¹The thesis shall be supervised by a lecturer from the Faculty of Engineering involved in this specialization or by a research associate requested to do so by the lecturer; Sections 9(1) and 27(2)(2) **ABMPO/TechFak** shall not be affected.

(3) ¹The results of the Bachelor's thesis shall be presented in a presentation lasting approximately 20 minutes followed by a discussion within the context of an advanced seminar. ²The date of the presentation shall be determined by the supervisor either during the final phase of work on the Bachelor's thesis or once the thesis has been submitted, and giving at least one week's notice.

Section 44 Evaluation of Achievements for the Bachelor's Degree Program

(1) The Bachelor's degree program shall have been completed successfully once all modules stipulated in **Appendix 1** have been completed successfully.

(2) ¹The grades for the specialization areas and the elective modules shall be based on the average of the grades for the module examinations. ²In the event that the sum of the ECTS credits achieved in one of these areas exceeds the number of ECTS credits stipulated in the **Appendix**, an interim grade shall be calculated according to the ECTS weighting of the individual modules and this shall be counted towards the final grade with the number of ECTS credits stipulated for the area in question. ³Sentence 1 shall apply accordingly to modules with several partial achievements.

2. Master's Examination

Section 45 Qualification for a Master's Degree, Certificates, Admission Requirements

(1) ¹A relevant degree within the meaning of Section 29 (1)(1) **ABMPO/TechFak** is a Bachelor's degree completed according to these examination regulations or an equivalent degree from Germany or another country that leads to a learning outcome equivalent to the Bachelor's degree in Electromobility ACES completed according to these

examination regulations. ²Whether or not graduates of other degree programs can be granted admission is checked on a case by case basis. ³When applying, students shall state whether they intend completing the Master's degree program in German or English.

(2) ¹The following documents shall be submitted pursuant to paragraph (2)(3) of the **Appendix to ABMPO/TechFak**:

- a) Notwithstanding Section 4 (5)(14)(1b) in Friedrich-Alexander-Universität Erlangen-Nürnberg's agreement on enrollment, re-registration, leave and de-registration (**ImmaS**), students studying the Master's degree program in German shall be required to submit proof of proficiency in German at the following level:
 - At least DSH-2 with at least 74% of the points attainable in both the written and oral parts of the examination
 - Alternatively TestDAF with at least 4 points in each area and at least 5 points in one area or
- b) If studying the Master's degree program in English, proof of proficiency in English at a level equivalent to at least C1 of the Common European Framework of Reference (CEFR) for languages; documents accepted as proof of proficiency are listed in the table of equivalence published by the Language Center at FAU.

²The admissions committee shall check any other proof of language proficiency differing from sentence 1 to determine if it can be accepted as equivalent on a case by case basis.

(3) Candidates shall be deemed to qualify for the Master's degree program as defined in (5)(2)(2) of the **Appendix to ABMPO/TechFak** if a total of at least 20 ECTS credits are obtained with an average grade of 3.0 or better in a selection of modules from the catalog for the Bachelor's degree program according to these degree program and examination regulations marked with a "K" in **Appendix 1** or comparable modules from another degree program.

(4) In the oral examination according to (5)(3) et seq. of **Appendix 1 ABMPO/TechFak**, applicants shall be evaluated according to the following criteria and weighting:

1. Quality of basic knowledge in "foundations of engineering with respect to electromobility" (in particular electronics, mechanical engineering and computer science), "engineering applications in electromobility" (in particular electronics, mechanical engineering and computer science) and "foundations of science" (e.g. physics) and "mathematics") 25 percent.
2. Quality of basic knowledge acquired during the Bachelor's degree program that forms the basis for specialization according to the options available in the Master's degree program; the applicant may choose to focus on one of the specialization areas for the oral admission examination (see **Appendix 3**) (25 percent)
3. Description of a successfully completed engineering project (e.g. Bachelor's thesis), familiarity with the relevant literature (30 percent)
4. A positive prognosis demonstrated by the applicant's academic progress in engineering modules to date; discussion based on graduation documents relating to the applicant's previous degree (in particular the transcript of records) (20%).

(5) Section 29 (2) **ABMPO/TechFak** shall apply with the proviso that the admissions committee may stipulate that certain language courses must be completed before the applicant is granted admission to the Master's degree program if they do not yet meet

all requirements but the commission is confident that these deficits can be compensated.

Section 46 Scope and Structure of the Master's Degree Program

(1) Pursuant to Section 37 (2), the Master's degree program comprises the modules in **Appendix 2a** (full-time) or **2b** (part-time).

(2) ¹Master's students shall choose two specializations in order to establish a subject-specific profile. ²Students shall acquire the skills listed in **Appendix 3**.

(3) Sections 40 and 41 shall apply accordingly for specializations and specialization modules, elective modules and practical training.

¹The key qualifications and the academic laboratory course shall be taken from the catalog recommended by the Degree Program Committee, which also stipulates the form of the relevant examinations. ²Section 41 (1) sentences 2 to 4 shall apply accordingly.

Section 47 Master's Degree Examinations

(1) ¹Students must have chosen their specializations pursuant to Section 46 (2) at the latest when they are admitted to the first examination of a specialization module.

Section 48 Research Project or Project Thesis

(1) ¹The aim of the research project is to enable students to learn to solve electromobility ACES problems independently at a Master's level. ²The research project shall have a workload of approximately 360 hours to be completed within five months, or eight months in the case of part-time study. ³The work period may not exceed six months in the case of full-time study, or nine months in the case of part-time study.

(2) ¹Section 43 (2) and (3) shall apply accordingly. ²The provisions stipulated in Section 32 (2)(2), Section 32 (3)(3) and Section 32 (5) to (10) shall apply accordingly to the research project.

Section 49 Requirements for Admission to the Master's Thesis

¹It is recommended that students only start work on the Master's thesis after successfully completing all other modules in the Master's degree program. ²The requirements for admission to the Master's thesis shall be as follows:

1. Students shall successfully complete modules worth at least 80 ECTS credits during their Master's degree program.
2. Submission of the relevant documents if the student was admitted to the Master's degree program subject to conditions pursuant to Section 45 (5) or modules were determined pursuant to **Appendix 2a** or **2b** footnote 2.

Section 50 Master's Thesis

(1) ¹The Master's thesis is intended to train and prove the student's ability to work independently on tasks relating to electromobility ACES at the Master's level. ²Requirements for the thesis shall be such that it can be completed within approximately 900 hours.

(2) Section 43 (2) and (3) shall apply accordingly.

Section 51 Evaluation of Achievements for the Master's Degree Program

(1) The Master's degree program shall have been completed successfully once all modules stipulated in **Appendix 2a**(full-time) or **Appendix 2b** (part-time)have been passed.

(2) Section 44 (2) shall apply accordingly with respect to grading.

Part III: Final Provisions

Section 52 Legal Validity

¹These degree program and examination regulations shall come into effect on the day after their publication. ²They shall apply to all students who start the Bachelor's or Master's degree program in Electromobility ACES in winter semester 2022/2023 or later.

**Appendix 1:
Study Plan for the Bachelor's Degree Program in Electromobility ACES**

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14		S15	S16
No.	Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Workload per semester in ECTS credits						EA/CA	Type and scope of examination	GOP/K
			L	T	P	AS		1.	2nd	3rd	4th	5th	6th			
								WS	SS	WS	SS	WS	SS			
													Mobility window			
1. Compulsory modules																
B 1	Mathematics for electromobility ACES 1 ¹⁾		4	2			7.5	7.5						EA/CA	Written examination 90 min + tutorial achievement ²⁾	GOP
B 2	Mathematics for electromobility ACES 2 ¹⁾		4	2			7.5		7.5					EA/CA	Written examination 90 min + tutorial achievement ²⁾	
B 3	Mathematics for electromobility ACES 3 ¹⁾		4	2			7.5			7.5				EA	Written examination 90 min	
B 4	Foundations of electrical engineering I		4	2			7.5	7.5						EA	Written examination 120 min	GOP
B 5	Foundations of electrical engineering II with practical		2	2	3		7.5		5	2.5				EA/CA	Written examination 90 min + practical achievement	K
B 6	Signals and systems I		2	2			5			5				PL	Written examination 90 min	K
B 7	Statics and mechanics of materials		3	2	2		7.5		7.5					EA	Written examination 90 min	GOP
B 8	Dynamics of rigid bodies		3	2	2		7.5			7.5				EA	Written examination 90 min	K
B 9	Foundations of computer science		3	3			7.5	7.5							See FPO INF	GOP
B 10	Machine-oriented programming in C		2	2			5		5						see FPO INF	
B 11	Materials science		3	1			5	5						EA	Written examination 90/120 min ²⁾	

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14		S15	S16	
No.	Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Workload per semester in ECTS credits						EA/CA	Type and scope of examination	GOP/K	
			L	T	P	AS		1.	2nd	3rd	4th	5th	6th				
			WS	SS	WS	SS		WS	SS								
B 12	Foundations of metrology and applied statistics		3	3			7.5				2.5	5		EA	Written examination 60/90/120 min ³⁾	K	
B 13	Engineering drawing I and II	Engineering drawing I			4		5	2.5						CA	Practical achievement (exercises on paper) and Practical achievement (computer exercises)		
		Engineering drawing II			2				2.5					CA		K	
Automotive product design																	
B 14a	Production engineering I and II		4		4		5				5			EA	Written examination 60/90/120 min ²⁾	K	
B 14b	Machine elements I		4	2			5			5				EA	Written examination 60/90/120 min ²⁾	K	
B 15	Applied automotive engineering		2			2	5			2.5	2.5			EA	Written examination 90/120 min ³⁾	K	
B 16	Business administration for engineers I		1	1			2,5	2,5						EA	Written examination 60/90/120 min ²⁾		
Total compulsory modules							105										
2. Specialization modules																	
B 17	Specialization modules ACES 1 pursuant to Section 40		6	6		4	20				10	10		EA	see Section 40 (3)		
B 18	Specialization modules ACES 2 pursuant to Section 40		6	6		4	20				5	15		EA	see Section 40 (3)		
Total specialization modules							40										
3. Interdisciplinary modules																	
B 19	Practical project ACES				8	2	5				5			CA	Practical achievement		
B 20	Elective modules		1	1		2	5						5	EA	^{2) 4)}		
B 21	Practical internship		>=12 weeks				12.5							12.5	CA	Practical achievement	

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14		S15	S16	
No.	Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Workload per semester in ECTS credits						EA/CA	Type and scope of examination	GOP/K	
			L	T	P	AS		1.	2nd	3rd	4th	5th	6th				
			WS	SS	WS	SS		WS	SS								
B 22	Bachelor's thesis with advanced seminar	Bachelor's thesis					12.5						10	EA	Bachelor's thesis + seminar achievement		
		Advanced seminar				2						2.5	EA				
Total interdisciplinary modules							35										
Total			61	41	25	16	180	32.5	27.5	30.0	30.0	30.0	30.0				
GOP modules							30										
K modules (subject-specific modules for admission to Master's degree program)							47.5										

Key:

- 1) The equivalence of the mathematics modules in the degree programs of the Faculty of Engineering shall be announced according to local practice.
- 2) The type and scope of the examination depend on the specific manner in which the respective module is taught; see module handbook for details.
- 3) The Degree Program Committee may also agree to the examination being offered additionally in two separate parts. See the module handbook for details.
- 4) See module handbook; pursuant to Section 28 **ABMPO/TechFak**, failed attempts are not counted and these modules do not have to be repeated if failed.

Appendix 2a: Full-time Master's degree program

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14
No.	Module name ^{1) 2)}	Teaching unit	SWS (se- mester hours)				ECTS cred- its	Distribution of work- load per semester in ECTS credits				Type and scope of the examination	
			L	T	P	AS		1.	2nd	3rd	4th		
M1	Specialization modules ACES 1	see Section 46 (3) in conjunction with Section 40	8	8		4	25	10	10	5		EA	see Section 46 (3) in conjunction with Section 40
M2	Specialization modules ACES 2	see Section 46 (3) in conjunction with Section 40	8	8		4	25	10	10	5		EA	see Section 46 (3) in conjunction with Section 40
M3	Elective modules	see Section 46 (4) in conjunction with Section 41	3	3		2	10		5	5		EA	^{3) 4)}
M4	Key qualifications and academic laboratory course pursuant to Section 46 (4)(2)	Key qualifications				2	5		2.5			CA	Course achievement ³⁾
		Academic laboratory course			2			2.5			CA	Laboratory achievement ³⁾	
M5	Practical internship		>= 8 weeks				10	10				CA	Practical achievement
M6	Project report with advanced seminar	Project report					15			12		EA	Study/research project + seminar achievement
		Advanced seminar				2				3		EA	
M7	Master's thesis and advanced seminar	Master's thesis					30				27	EA	Master's thesis + seminar achievement
		Advanced seminar				2					3	EA	
Summen			19	19	2	16	120	30.0	30.0	30.0	30.0		

Key:

- ¹⁾ Due to the specific subject skills that must be acquired as part of the learning outcome of the Master's degree program, students are expected to prove on the basis of the module description that they will acquire additional skills compared to those acquired in their previous Bachelor's degree and to provide proof of meeting any requirements stipulated during the qualification assessment process. This is detailed in the relevant module description in the context of the learning outcomes of the Master's degree program.

- 2) see Section 45 (5) The admissions committee may stipulate certain modules from the Bachelor's degree program (**Appendix 1**) and suitable language courses that applicants have not already completed during their previous studies to compensate for skills they are lacking.
- 3) see Section 46(3) or (4) The type and scope of the examination depend on the specific manner in which the respective module is taught; see module handbook for details.
- 4) see module handbook; footnote 2 notwithstanding, the following applies: pursuant to Section 28 **ABMPO/TechFak**, failed attempts are not counted and these modules do not have to be repeated if failed.

Appendix 2b: Master's Degree Program Part-Time

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18
No.	Module name ^{1) 2)}	Teaching unit	SWS (se- mester hours)				ECTS cred- its	Workload per semester in ECTS credits								Type and scope of the examination	
			L	T	P	AS		1.	2nd	3rd	4th	5th	6th	7th	8th		
M1	Specialization modules ACES 1		8	8		4	25	10	5	5	5					EA	see Section 45 (3) in conjunction with Section 40
M2	Specialization modules ACES 2		8	8		4	25	5	5	5	10					EA	see Section 45 (3) in conjunction with Section 40
M3	Elective modules		3	3		2	10		5	5						EA	^{3) 4)}
M4	Key qualifications and	Key qualifications				2	5					2.5				CA	Course achievement ³⁾
	Academic laboratory course	Academic labora- tory course			2							2.5				CA	Laboratory achievement ³⁾
M5	Practical internship		>= 8 weeks				10					5	5			CA	Practical achievement
M6	Project report with advanced seminar	Project report					15					5	7			EA	Study/research project
		Advanced seminar				2						3				EA	+ seminar achievement
M7	Master's thesis and advanced seminar	Master's thesis					30							15	12	EA	Master's thesis
		Advanced seminar				2								3		EA	+ seminar achievement
		Total	19	19	2	16	120	9	15.0	15.0	15.0	15.0	15.0	15.0	15.0		

Key:

- ¹⁾ Due to the specific subject skills that must be acquired as part of the learning outcome of the Master's degree program, students are expected to prove on the basis of the module description that they will acquire additional skills compared to those acquired in their previous Bachelor's degree and to provide proof of meeting any requirements stipulated during the qualification assessment process. This is detailed in the relevant module description in the context of the qualification goals of the Master's degree program.

- ²⁾ see Section 45 (5) The admissions committee may stipulate certain modules from the Bachelor's degree program (**Appendix 1**) and suitable language courses that applicants have not already completed during their previous studies to compensate for skills they are lacking.
- ³⁾ see Section 46(3) or (4) The type and scope of the examination depend on the specific manner in which the respective module is taught; see module handbook for details.
- ⁴⁾ see module handbook; footnote 2 notwithstanding, the following applies: pursuant to Section 28 **ABMPO/TechFak**, failed attempts are not counted and these modules do not have to be repeated if failed.

Appendix 3: Specializations

No.	Specialization modules	Acquiring skills in a selection of the following areas of application (among others)
1.	AI and autonomous driving	Machine learning, automatic control, image processing
2.	Connectivity	Digital transmission, communication systems, computer communications, smart grids
3.	E-powertrain	Power engineering, electrical drives, automotive engineering, fuel cells
4.	Sustainable mobility and production technology	Resource-efficient production, electrical energy storage, lightweight materials