Degree Program and Examination Regulations for the Master's Degree Program in Advanced Materials and Processes at the Faculty of Engineering at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) – FPO MAP –

Dated March 28, 2024

Based on Section 9 (1) in conjunction with Section 80 (1)(1), Section 84 (2)(1), Section 90 (1)(2) and Section 96 (3)(1) Bavarian Higher Education Innovation Act dated August 5, 2022 (**BayHIG**), FAU enacts the following degree program and examination regulations:

Contents:

Section 39 Scope

(1) [1]These degree program and examination regulations govern admission to the Master's degree program "Advanced Materials and Processes" and the conducting of the examinations required in order to successfully complete the degree program. [2]They complement the current version of the General Degree Program and Examination Regulations for Bachelor's and Master's Degree Programs and Other Study Programs within the meaning of Section 77 (5) **BayHIG** at the Faculty of Engineering at FAU – **ABMPO/TF**.

Section 40 Qualification for Admission to the Master's Degree Program

(1) [1]A relevant degree as defined in Section 33 (1)(1) **ABMPO/TF** is a Bachelor's degree in Chemical and Biological Engineering or Materials Science and Engineering

from FAU or a degree from a university in Germany or another country with equivalent content.

(2) [1]As stipulated in Section 2(6)(3) of the **Appendix to ABMPO/TF**, applicants are required to provide additional proof of English language skills equivalent to at least Level B2 of the Common European Framework of Reference (CEFR) by submitting either relevant school reports or certificates issued by a language school or university. [2]Proof pursuant to sentence 1 can in particular be provided by submitting a school leaving certificate or a certificate issued by the school providing evidence that English lessons up to a level equivalent to B2 CEFR have been taken at school or evidence of having successfully completed the Test of English as a Foreign Language (TOEFL) with at least 80 points in the iBT. [3]Proof of language proficiency pursuant to sentence 1 (1) does not need to be submitted if the applicant acquired their university entrance qualification or relevant undergraduate degree in English.

(3) Notwithstanding Section 5 sentences 1 to 4 of the **Appendix to ABMPO/TF**, all applicants with an overall grade or an average of their achievements to date in their relevant degree pursuant to paragraph 1 of 2.50 or better shall be invited to a selection interview pursuant to Section 4 or to an electronic admission examination pursuant to Section 7 of the **Appendix to ABMPO/TF** in conjunction with Section 5; all other applicants are considered unsuitable and shall receive a rejection notification of rejection stating reasons for the decision and information on legal remedies available.

(4) [1]If a selection interview is held, it will last 20 minutes for each applicant, notwithstanding Section 6(1) of the **Appendix to ABMPO/TF**. [2]Notwithstanding Section 6 (4) of the **Appendix to the ABMPO/TF**, the selection interview is held by two authorized members of the Departments of Materials Science and Engineering and Chemical and Biological Engineering, appointed by the admissions committee pursuant to Section 14 (2)(4) **ABMPO/TF**. [3]The selection interview is held in English. [4]In the selection interview, applicants outline their qualifications and previous work on subjects relevant to the degree program and answer questions on this as well as answer subject-related questions on topics of relevance to the Master's degree program at an appropriate level; the suitability of applicants for admission to the Master's degree program is assessed on the basis of the following weighted criteria:

1. Quality of fundamental knowledge in the areas of chemical and biological engineering or materials science and engineering depending on the applicant's previous education (weighting 40%)
2. Quality of the subject-related knowledge acquired during the Bachelor's degree program, internships or lectures as a basis for a later specialization in two of the four focal subjects offered during the Master's degree program, and the ability to derive fundamental relationships in the topics covered by the relevant focal subjects based on fundamental knowledge in the areas of chemical and biological engineering or materials science and engineering; the applicants chooses the focal subjects to be discussed during the interview (weighting 40%)
3. Ability to tackle interdisciplinary problems in the area of chemical and biological engineering and materials science and engineering and find solutions (weighting 20%).

(5) [1]If an electronic admissions examination is held pursuant to Section 7 of the **Appendix**to **ABMPO/TF**, it will test the candidate's knowledge of chemical and biological engineering and materials science and engineering. [2]This does not affect the rest of Section 7 **ABMPO/TF**.

Section 41 Admissions Committee

(1) [1]An admissions committee is formed pursuant to Section 14 **ABMPO/TF** to review whether applicants meet the qualification and admission requirements for the Master's degree program pursuant to Section 40. [2]The admissions committee includes one professor involved in teaching in the Master's degree program from the area of chemical and biological engineering and one from materials science and engineering, as well as one research associate from each of the areas.

(2) The members are appointed by the Faculty Council of the Faculty of Engineering for a term of office of three years based on the proposal of the Degree Program Committee; re-election is permitted.

(3) The members of the admissions committee appoint one of their members who is a professor to the position of chairpersons and one as deputy chairperson.

Section 42 Scope and Structure of the Degree Program, Start of Degree Program, Teaching and Examination Language

(1) The degree program consists of 19 modules accounting for a total of 120 ECTS credits pursuant to **Appendix 1**.

(2) [1]At the beginning of the first semester, the admissions committee decides which fundamentals (Fundamentals I to IV) each individual student should take on the basis of the module handbook. [2]These modules teach the students the basics they have been determined to be lacking in the areas of chemical and biological engineering or materials science and engineering depending on their previous education and the skills they have demonstrated during the qualification assessment process. [3]Due to the specific subject competencies that must be acquired as part of the learning outcome of the Master's degree program in Advanced Materials and Processes (MAP), students are expected to prove that they will acquire additional skills in the Master's degree program compared to the skills acquired in their previous Bachelor's degree program when choosing modules.

(3) [1]As they progress through the Master's degree program in Advanced Materials and Processes, students choose Focal Subjects I and II from the following four focal subjects:

1. Advanced Processes
   [1]This focal subject combines knowledge of modern materials science processing of complex materials with methods of modern process engineering. [2]This allows students to acquire skills enabling them to pursue new avenues in material development following the principle of "innovation through synergy".
2. Biomaterials and Bioprocessing
   [1]The focal subject Biomaterials and Bioprocessing enables students to gain an understanding of construction principles and optimization strategies for selected biomaterials. [2]They also receive an overview of experimental methods for

transferring construction principles from nature and designing materials with specific biological interactions, or to specifically influence the growth of tissue using biomaterials.

3. Computational Materials Science and Process Simulation
   [1]In this focal subject, students acquire the theoretical and practical skills they require in order to model and simulate materials and processes from the atomic scale to macroscopic systems such as reactors or components. [2]First of all, students receive an introduction to numerical methods and an overview of principles, applications and framework conditions. [3]After that, students learn how to handle modern simulation packages and the underlying algorithms.
4. Nanomaterials and Nanotechnology
   [1]The focal subject Nanomaterials and Nanotechnology covers the entire process chain for processing nanodisperse systems, starting from the size-dependent properties of nanomaterials. [2]Particular attention is paid to the challenges of bridging the gap from atomic and molecular interactions to integration in devices and finally to technical implementation.

[3]Students also choose one other module from one of the four focal subjects (elective module). [4]Students must choose their focal subject at the latest by the end of the first semester.

(4) The degree program may only be started in the winter semester.

(5) [1]Notwithstanding Section 4 (5) **ABMPO/TF**, the teaching and examination language in the Master's degree program in Advanced Materials and Processes is English. [2]Otherwise, Section 4 (5) **ABMPO/TF** applies with the proviso that individual teaching units and examinations may be held in German.

Section 43 Focal Subjects I and II

(1) [1]The overriding learning outcome of focal subjects I and II is firstly to give students the opportunity to explore the theory of one or more of the focal subjects stated in Section 42 (3). [2]Secondly, the modules pursue a methodological learning outcome by teaching students to take an interdisciplinary approach. [3]Thirdly, the element of choice gives students the opportunity to create their own particular profile in view of their future career. [4]The specific learning outcomes for the individual modules depend on the chosen focal subject pursuant to Section 42 (3), the chosen module and the respective module description.

(2) [1] The type and scope of the examination are dependent on the skills for the chosen module according to Section 1 and the module handbook. [2]Examinations take one of the following forms: Oral examination (45 minutes) or written examination (60, 90 or 120 minutes), seminar paper (10 pages) or report (4 to 6 pages). [3]The module catalog is announced before the beginning of the semester in accordance with local practice.

Section 44 Scientific Skills I and II

(1) The modules Scientific skills I and II consist of the seminar in scientific writing, the poster presentation (2.5 ECTS) and the general laboratory course (2.5 ECTS).
(2) [1]The learning outcome of the modules Scientific skills I and II is for students to independently gather, assess, interpret and provide a clear and concise summary of scientifically and technologically relevant information on a research area of relevance to their studies. [2]The second learning outcome is aimed at promoting personal and

social skills through preparing, reporting on and presenting a topic relating to the subject to a specialist audience at Master's level in a manner tailored to the target group. [3]During the general laboratory course, students are able to deepen and expand their expertise in one of the two main subjects in the Master's degree program, i.e. materials science and engineering or chemical and biological engineering by applying scientific methodology in theory and laboratory practice.

Section 45 Elective Course

(1) [1]The overriding learning outcome for the elective course is for students to gain more advanced knowledge and expand their subject-related skills relevant to research in the four focal subjects pursuant to Section 42 (3)(1). [2]The choice of a further module, in particular in combination with the choice of focal subject I and II, gives students the opportunity to tailor their profile in view of their future careers.

(2) [1]The elective course is worth 5 ECTS credits and must be selected from one of the four focal subjects pursuant to Section 42 (3)(1). [2]The specific learning outcomes for the individual modules depend on the chosen module and are stipulated in the module handbook. [3]Due to the specific subject skills that must be acquired as part of the qualification goals of the Master's degree program as defined in the module description, modules may not be taken twice and accredited to different areas of the program.

(3) The type and scope of the examination and teaching units are stipulated in Section 43 (2) and Appendix 1.

Section 46 Admission Requirements for the Master's Thesis

Passing the compulsory modules set forth in the **Appendix** is a requirement for admission to the Master's thesis.

Section 47 Master's Thesis

(1) [1]Students register for the Master's thesis after successfully completing all other required modules. [2]Exceptions are only permitted in exceptional circumstances (e.g. partaking in the additional qualifications according to Section 49 in conjunction with **Appendix 2**).

(2) [1]The Master's thesis is intended to demonstrate students' ability to solve problems independently in a relevant current area of research. [2]The Master's thesis includes a presentation followed by a discussion on the results of the thesis. [3]The date of the presentation is determined by the supervisor and the student is informed of the date in good time.

(3) With respect to supervision of the Master's thesis, the proviso applies that the supervisor must be involved in the Master's degree program in Advanced Materials and Processes or at one of the departments Materials Science and Engineering or Chemical and Biological Engineering.

(4) The Master's thesis is written in English.

Section 48 Evaluation of Achievements for the Master's Degree Program

The Master's degree program is considered to have been completed successfully if all modules stipulated in **Appendix 1** are graded at least "sufficient".

Section 49 Additional Qualifications Research Focus and Industry Focus

(1) [1]Students registered on the Master's degree program in Advanced Materials and Processes can also complete the additional qualifications Research Focus and Industry Focus parallel to their main studies. Successfully completing the additional qualifications provides students with proof of their additional competencies in the area of academic working (Research Focus) or industry (Industry Focus).

(2) The additional qualification "Research Focus" comprises the following four modules with the specified ECTS credits:

1. Free specialization, preferably with a scientific or technical focus (5 ECTS credits)
2. Science-oriented soft skills (5 ECTS credits)
3. Research-oriented mini project (10 ECTS)
4. Internship in industry, extramural institutes or universities (10 ECTS credits).

(3) The additional qualification "Industry Focus" comprises the following four modules with the specified ECTS credits:

1. Free specialization, preferably with a technical or industrial focus (5 ECTS credits)
2. Workplace-oriented soft skills (5 ECTS credits)
3. Application-oriented mini project 2 (10 ECTS credits)
4. Industrial internship (10 ECTS credits)

(4) [1]Details on the modules and the type and scope of examinations are stipulated in **Appendix 2**. [2]With respect to registration for examinations, withdrawal, cheating, breach of regulations and assessment, the regulations stipulated in these degree program and examination regulations will apply accordingly in conjunction with **ABMPO/TF**. [4]Students must successfully complete the mini project module pursuant to **Appendix 1** before being admitted to the examinations for the research or application-oriented mini project pursuant to (2) or (3).

(5) [1]Students choose a free specialization pursuant to (2) or (3) from the range of modules offered at FAU, preferably with a scientific-technical orientation (Research Focus) or technical-industrial orientation (Industry Focus). [2]The overriding learning outcome of these free specialization modules is to acquire additional knowledge and competencies in a new subject area or to acquire more extensive knowledge in a topic area already included in the MAP curriculum by attending an advanced course. [3]The specific learning outcome of the individual modules and the type and scope of teaching units and examinations depend on the specific manner in which the respective module is taught and are regulated by the applicable **(degree program and) examination regulations** and/or module handbook.

(6) [1]After successfully completing the modules stated in (2) or (3) in conjunction with **Appendix 2** the student will receive a certificate “Additional Research Qualifications” or “Additional Qualifications for Business and Industry” that states the successfully completed modules including ECTS credits and module grades. [2]The completed modules are not included in the Transcript of Records. [3]In the event that a student does not complete the additional qualifications, all completed modules are listed in a separate section in the Transcript of Records. [4]The student can file a request with the Examinations Office for the results from the additional qualifications to be omitted from the final certificate at the latest eight weeks before certificates are issued.

Section 50 Legal Validity

(1) [1]These degree program and examination regulations shall come into effect on April 1, 2024. [2]They shall apply to all students starting a degree program from winter semester 2024/2025 onward.

(2) [1]The degree program and examination regulations for the Master's degree program in Advanced Materials and Processes from the Elite Network of Bavaria at the Faculty of Engineering at Friedrich Alexander Universität Erlangen-Nürnberg (FAU) – FPO MAP – dated May 15, 2006, last amended by statute of January 15, 2019 shall become invalid as of September 30, 2027. [2]Examinations according to the valid degree program and examination regulations stated in sentence 1 shall be offered for the last time in summer semester 2027. [3]From the date stated in sentence 2, those students who are affected by the degree program and examination regulations FPO MAP becoming invalid shall take their examinations in accordance with the version of the degree program and examination regulations valid at this time.

Appendix 1: Structure of the Degree Program

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload in ECTS credits				Type and scope of the examination
		L	T	P	S		1. sem.	2. sem.	3. sem.	4. sem.	
Fundamental I		2	1			**5**	5				NGW (WE 90 min)
Fundamental II		2	1			**5**	5				NGW (WE 90 min)
Fundamental III		2	1			**5**	5				NGW (WE 90 min)
Fundamental IV		2	1			**5**	5				NGW (WE 90 min)
Basics in advanced processes	Basics in advanced processes I	2				**5**	2.5				GW (WE, 120 min) or 2x WE 60 min) [2]
	Basics in advanced processes II	2						2.5			
Basics in biomaterials and bioprocessing	Basics in biomaterials and bioprocessing I	2				**5**	2.5				GW (WE, 120 min) or 2x WE 60 min) [2]
	Basics in biomaterials and bioprocessing II	2						2.5			
Basics in computational materials science and process simulation	Basics computational materials science and process simulation I	2				**5**	2.5				GW (WE, 120 min) or 2x WE 60 min) [2]
	Basics computational materials science and process simulation II	2						2.5			
Basics in nanomaterials and nanotechnology	Basics nanomaterials and nanotechnology I	2				**5**	2.5				GW (WE, 120 min) or 2x WE 60 min) [2]
	Basics nanomaterials and nanotechnology II	2						2.5			
Focal subject I a [1]		2	1/2			**5**		5			[1]
Focal subject I b [1]		2	1/2			**5**			5		[1]
Focal subject I c [1]		2	1/2			**5**			5		[1]

Focal subject II a [1)]		2	1/2			**5**		5			[1)]
Focal subject II b [1)]		2	1/2			**5**			5		[1)]
Focal subject II c [1)]		2	1/2			**5**			5		[1)]
Mini project				8		**10**		10			GW: SA
Scientific skills I				2		**2.5**	2.5				NGW (PT: Report 4-6 pages)
Scientific skills II					2	**2.5**			2.5		GW AT (6-8 pages, poster presentation)
Elective course		2	1/2			**5**			5		[1)]
Master's thesis						**27** **3**				30	GW (Master's thesis) [4)] + (presentation, 30 min) (90 % + 10 %)
Total SWS and ECTS credits:		**38**	**11**			**120**	**32.5**	**30**	**27.5**	**30**	
		49									

GW = graded work
NGW = Non-graded work
PT = Practical task pursuant to Section 7 (3) **AMBPO/TF**
AT = Assessed task pursuant to Section 7 (3) **ABMPO/TF**
WE xmin = Written examination x minutes
o xmin = Oral examination x minutes.

[1)] see Section 43 (2) The type and scope of the teaching units depend on the specific manner in which they are taught; see module handbook for details.
[2)] Students may choose to take one 120 minute written examination (combined examination) or two partial examinations of 60 minutes each in the individual subject areas (e.g. M5a and M5b).
[3)] 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 Section 36 **ABMPO/TF**.

Appendix 2: Additional qualifications pursuant to Section 49

Additional qualifications *Research Focus*

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload in ECTS credits				Type and scope of the examination
		L	T	P	S		1. sem.	2. sem.	3. sem.	4. sem.	
Free specialization module pursuant to Section 49 (5)						**5**		5			See Section 49 (5)
Soft skills	Science-oriented soft skills					**5**		5			NGW[1)]
Mini project 2	Research-oriented mini project					**10**			10		GW (AT)
Internship	Internship in industry, extramural institutes or universities (also abroad) at least 12 weeks					**10**			10		NGW (PT)
Total SWS and ECTS credits:						**30**	**0**	**10**	**20**		

GW = graded work (GW)
NGW = course achievement (ungraded)
AT = assessed task pursuant to Section 7 (3) **ABMPO/TechFak**
PT =Practical task pursuant to Section 7 (3) **AMBPO/TechFak**

[1)] Students choose the soft skill courses from the range of courses offered at FAU. The type and scope of the examination depend on the specific manner in which the respective module is taught and are regulated by the applicable **degree program and examination regulations** and/or the relevant module handbook.

Additional qualifications *Industry Focus*

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload in ECTS credits				Type and scope of the examination
		L	T	P	S		1. sem.	2. sem.	3. sem.	4. sem.	
Free specialization module pursuant to Section 49 (5)						**5**		5			See Section 49 (5)
Soft skills	Workplace-oriented soft skills					**5**		5			SL[1)]
Mini project 2	Application-oriented mini project					**10**			10		PL (SeL)
Internship (industry)	Internship (industry) of at least 12 weeks					**10**			10		SL (PrL)
Total SWS and ECTS credits:						**30**	**0**	**10**	**20**		

GW = graded work
NGW = Non-graded work
AT = assessed task pursuant to Section 7 (3) **ABMPO/TechFak**
PT = Practical task pursuant to Section 7 (3) **AMBPO/TechFak**

[1)] Students choose the soft skill courses from the range of courses offered at FAU. The type and scope of the examination depend on the specific manner in which the respective module is taught and are regulated by the applicable **degree program and examination regulations** and/or the relevant module handbook.

Appendix 3: Glossary

Basics	Allgemeine Fächer
Externes Praktikum (Industrie)	Internship (industry)
Externes Praktikum (Wissenschaft)	Internship (research)
Focal subject 1	Schwerpunkt 1
Focal subject 2	Schwerpunkt 2
Fundamentals	Grundlagenfächer
Klausur (K)	Written examination
Masterarbeit	Master's thesis
Miniprojekt	Miniproject
Mündliche Prüfung	Oral examination
Praktikumsleistung (PrL)	Practical task
Prüfungsleistung (PL, benotet)	Graded work
Schriftliche Ausarbeitung	Written elaboration
Seminarleistung (SeL)	Assessed task
Soft-Skills / Schlüsselqualifikationen	Soft skills
Studienleistung (SL)	Non-graded work
Vortrag	Oral presentation
Wahlmodul	Free specialisation
Scientific skills I	Wissenschaftsskills I
Scientific skills II	Wissenschaftsskills II
Zusatzstudien Industrie	Additional qualifications for business and industry / industry focus
Zusatzstudien Wissenschaft	Additional research qualifications / research focus