§ 38 Master's Program Technology Management and Optimization

(1) Structure of studies

The consecutive master program Technology Management and Optimization comprises three semesters and builds on the Ravensburg-Weingarten University of Applied Sciences (RWU) bachelor degree programs in Industrial Engineering (Technology Management) and Physical Engineering. Admission is also possible with a university degree in industrial engineering or related subjects from other universities or a university degree in a technical or natural scientific discipline. Further details are regulated by the admission statutes of Ravensburg-Weingarten University of Applied Sciences (RWU) for the master program in Technology Management and Optimization in their current version.

For the successful completion of the consecutive study program, courses as well as the associated study and examination achievements to the extent of 90 ECTS are required. These are shown in tables 1 to 3. The degree is completed in the 3rd semester with the master examination.

Graduates of Bachelor's degree programs whose studies comprise less than 210 ECTS must complete the remaining ECTS at the latest by the time they register for the master's thesis in accordance with the admission regulations of Ravensburg-Weingarten University (RWU) for the master program Technology Management and Optimization in its current version.

(2) Course of studies

The master program in Technology Management and Optimization (TMO) can be studied with three profile directions:

- a profile direction with a technical orientation (TMO Company Optimization) (UO)),
- a profile direction with a development-oriented orientation (TMO Development and Technological Innovation) (EN)) and
- a profile with an international orientation (TMO International and Entrepreneurship) (IE)), which requires at least one semester of study at a foreign partner university.

All profiles are completed with a master's thesis.

The selection of the profile takes place after the beginning of the study by registration in the examination office.

The study program uses modern didactic forms of learning. The active participation of the student is a mandatory prerequisite for the acquisition and proof of competence.

(3) Courses and examinations

The courses required for successful completion as well as the associated course and examination achievements are shown in tables 1, 2 and 3. The following abbreviations are used for this purpose:

Type of course		Type of exam		Further abbreviations	
V	Lecture	**K(xx)**	Written examination duration of xx minutes	**SWS**	Number of semester hours per week
P	Practical course, exercises	**M**	Oral examination	**ECTS**	Number of credit points required (§3)
VP	Lecture with integrated exercises	**R**	Seminar paper and presentation	**ST**	Summer term
Ü	Exercises	**PA**	Practical work in combination with tests	**WT**	Winter term
S	Seminar	**PF**	Portfolio		
PR	Project work	**D**	Documentation		
L	Laboratory/practical course	**H**	Term paper		
PB	Practical experience report				
MT	Master's thesis				

The examination requirements for the courses at foreign partner universities are determined by the partner university. Quality assurance on the part of Ravensburg-Weingarten University takes place via learning agreements. The crediting of the study achievements done abroad by students enrolled at the Ravensburg-Weingarten University is done according to the guidelines for the recognition of study work done abroad by students enrolled at Ravensburg-Weingarten University in their currently valid version.

The respective number of semester hours per week (SWS) specified in Tables 1, 2 and 3 is defined in each case as the maximum number of attendance hours. The details for the respective course are regulated by the module handbook.

Compulsory attendance in courses is decided for the individual case by the faculty council for the respective semester. In the case of seminars, attendance is compulsory for the issue of topics in the opening event, irrespective of the above regulation; participation in a seminar is no longer possible if the student did not attend the opening event for the issue of topics, unless the student is not responsible for the failure to attend.

The language of instruction is German or English, the details are regulated by the module handbook. German-language courses can also be offered in English on a semester-by-semester basis in agreement with the dean of studies. This is to be announced by the lecturer at the latest at the beginning of the lecture.

The language of instruction in module 14 of the profile International and Entrepreneurship (IE), which is studied abroad at a partner university, is English. Therefore, good English language skills must be demonstrated by taking one of the following tests when taking this profile:

- OPT with at least 80 points
- Oxford B2
- Cambridge B 2 or FCE
- IAELTS with 6.5
- TOEFL with 90 points.

The test must not have been taken more than two years ago.

As a rule, the examinations are conducted in the respective language of instruction. In agreement with the dean of studies, the examination may also be taken in German or English. This must be announced by the lecturer at the beginning of the lecture at the latest.

In addition to the examinations listed in tables 1, 2 and 3, the lecturer may, at his or her own discretion, specify voluntary examinations to be taken during the course of study as partial module examinations. The determination as well as the type, scope and weighting of the partial module examinations are to be announced to the students at the beginning of the lecture, usually in the first lecture, and announced by the faculty by means of a notice. The assessment of the partial module examinations is included in the module examination with their respective weight.

(4) Elective courses

Students can freely choose elective courses amounting to 10 ECTS. The elective courses must be taken from the graded range of courses offered by Ravensburg-Weingarten University of Applied Sciences, another German college/university and/or as part of a semester abroad.

As a rule, only subjects from Master programs can be chosen as electives. Elective courses may not be substantially identical in content to compulsory and already taken elective modules. In case of doubt, the chairperson of the Examination Board decides on the creditability of an elective course.

(5) Master's Thesis

In addition to § 10 of the General Part of the Study and Examination Regulations, the following regulations apply:

The master's thesis is usually written at the Ravensburg-Weingarten University of Applied Sciences, but can also be written in cooperation with a company, a research institution or at a partner university abroad. It is to be written in German or English. The individual topics are related to the content of the chosen profile fields. After completion, the results of the master's thesis are presented in a public colloquium at the Ravensburg-Weingarten University.

The topic, task and scope of the master's thesis are to be limited by the task-setter in such a way that the work can be completed in approximately 600 working hours, corresponding to 20 ECTS. The thesis must be submitted no later than six months after the registration date either in printed and electronic form to the examination office of the Ravensburg-Weingarten University or purely electronically via a digital submission system provided by the faculty.

The master seminar serves to reflect on the study contents of the master study program as well as their interconnectedness against the background of the master's thesis and is conducted by the supervisor of the master's thesis.

Table 1: Profile Company Optimization (TMO UO)

Technology Management and Optimization (TMO)		**TMO-Profile: Company Optimization (UO) Assigned semester, ECTS and SWS**						**Type of examination**
Modules	Courses	1 (WT)		2 (ST)		3 (WT)		graded
		ECTS	SWS	ECTS	SWS	ECTS	SWS	
Module 1 Digital and agile product development	Digital design methods	3	2					Portfolio
	Agile development processes	2	2					
Module 2 Modern material technologies	Modern material technologies							M
Module 3 Cyberphysical systems	Cyberphysical systems							K90 or Portfolio
Module 4 Autonomous systems	Machine vision							PA
	Autonomous systems							
Module 5 Digital transformation design	Digital transformation design							Portfolio
Module 6 Automation systems	Automation systems			5	4			K60 or Portfolio
Module 7 Operations management	Analysis and optimization of production systems	3	3					K90
	Factory planning	2	1					
Module 8 Digital production	Digital planning of production systems			3	2			Portfolio
	Simulation of production systems			2	2			
Module 9 Technology management	Technology intelligence and futurology			3	3			Portfolio
	Technology development and implementation			2	2			
Module 10 Business model optimization	Business model optimization			5	4			Portfolio
Module 11 Development of digital business models	Development of digital business models	5	4					Portfolio
Module 12 Optimization with Matlab	Optimization with Matlab	5	4					K60
Module 13 Design of Experiments	Design of Experiments			5	4			M
Module 14 Data Science	Data Science	5	4					K90 or Portfolio
Module 15 Applications of business analytics	Applications of business analytics	5	4					Portfolio
Module 16 Machine learning	Machine learning							M or K60
Module 17 Lean- and digitalization project	Lean and digitalization project			5	4			Portfolio

Module 18 Elective courses for specialization in the field of industrial engineering	Elective courses also from other faculties					10		
Module 19 Entrepreneurship	Foreign Studies with Partner Universities							
Master's thesis	Master seminar and Master's thesis					20		MT
Sum		**30**	**24**	**30**	**25**	**30**	**0**	

Table 2: Profile Development and Technological Innovation (TMO EN)

Technology Management and Optimization (TMO)		**TMO-Profile: Development and Technological Innovation (EN) : Assigned semester, ECTS and SWS**						**Type of examination**
Modules	Courses	1 (WT)		2 (ST)		3 (WT)		graded
		ECTS	SWS	ECTS	SWS	ECTS	SWS	
Module 1 Digital and agile product development	Digital design methods	3	2					Portfolio
	Agile development processes	2	2					
Module 2 Modern material technologies	Modern material technologies			5	4			M
Module 3 Cyberphysical systems	Cyberphysical systems	5	4					K90 or Portfolio
Module 4 Autonomous systems	Machine vision			3	2			PA
	Autonomous systems			2	2			
Module 5 Digital transformation design	Digital transformation design			5	4			Portfolio
Module 6 Automation systems	Automation systems			5	4			K60 or Portfolio
Module 7 Operations management	Analysis and optimization of production systems							K90
	Factory planning							
Module 8 Digital production	Digital planning of production systems							Portfolio
	Simulation of production systems							
Module 9 Technology management	Technology intelligence and futurology			3	3			Portfolio
	Technology development and implementation			2	2			
Module 10 Business model optimization	Business model optimization							Portfolio
Module 11 Development of digital business models	Development of digital business models							Portfolio
Module 12 Optimization with Matlab	Optimization with Matlab	5	4					K60
Module 13 Design of Experiments	Design of Experiments			5	4			M
Module 14 Data Science	Data Science	5	4					K90 or Portfolio

Module 15 Applications of business analytics	Applications of business analytics	5	4					Portfolio
Module 16 Machine learning	Machine learning	5	4					M or K60
Module 17 Lean- and digitalization project	Lean and digitalization project							Portfolio
Module 18 Elective courses for specialization in the field of industrial engineering	Elective courses also from other faculties					10		
Module 19 Entrepreneurship	Foreign Studies with Partner Universities							
Master's thesis	Master seminar and Master's thesis					20		MT
Sum		**30**	**24**	**30**	**25**	**30**	**0**	

Table 3: Profile International and Entrepreneurship (TMO IE)

Technology Management and Optimization (TMO)		**TMO-Profile: International and Entrepreneurship (IE) Assigned semester, ECTS and SWS**						**Type of examination**
Modules	Courses	1 (ST)		2 (WT)		3 (ST)		graded
		ECTS	SWS	ECTS	SWS	ECTS	SWS	
Module 1 Digital and agile product development	Digital design methods							Portfolio
	Agile development processes							
Module 2 Modern material technologies	Modern material technologies							M
Module 3 Cyberphysical systems	Cyberphysical systems							K90 or Portfolio
Module 4 Autonomous systems	Machine vision							PA
	Autonomous systems							
Module 5 Digital transformation design	Digital transformation design							Portfolio
Module 6 Automation systems	Automation systems	5	4					K60 or Portfolio
Module 7 Operations management	Analysis and optimization of production systems							K90
	Factory planning							
Module 8 Digital production	Digital planning of production systems	3	2					Portfolio
	Simulation of production systems	2	2					
Module 9 Technology management	Technology intelligence and futurology	3	3					Portfolio
	Technology development and implementation	2	2					
Module 10 Business model optimization	Business model optimization	5	4					Portfolio
Module 11 Development of digital business models	Development of digital business models							Portfolio
Module 12 Optimization with Matlab	Optimization with Matlab							K60
Module 13 Design of Experiments	Design of Experiments	5	4					M
Module 14 Data Science	Data Science							K90 or Portfolio
Module 15 Applications of business analytics	Applications of business analytics							Portfolio

Module 16 Machine learning	Machine learning							M or K60
Module 17 Lean- and digitalization project	Lean and digitalization project	5	4					Portfolio
Module 18 Elective courses for specialization in the field of industrial engineering	Elective courses also from other faculties					10		
Module 19 Entrepreneurship	Foreign Studies with Partner Universities			30				
Master's thesis	Master seminar and Master's thesis					20		MT
Sum		**30**	**25**	**30**	**0**	**30**	**0**	