## § 47 Bachelor's Study Program Physical Engineering

### (1) Structure of the Study Program

The Physical Engineering program is divided into two study phases. The first study phase represents the basic studies and concludes with the intermediate examination according to § 7 Section 2 of the General Part of the Study and Examination Regulations. Courses in the first three semesters are offered in English if the course begins in the summer semester, and in German if the course begins in the winter semester. The second study phase is the main study period, which includes compulsory subjects and individual electives as well as the compulsory practical study semester and the Bachelor's examination. The standard period of study is seven semesters. The successful completion of the program requires 210 ECTS credits. The program is completed with the Bachelor's examination.

### (2) Courses and examinations

The courses of the two study phases as well as the associated examination achievements result from the following tables 1 to 3. The following abbreviations are used:

| Type of course | | Type of exam | | Scope of exam | |
|---|---|---|---|---|---|
| V | Lecture | B | Bachelor's thesis | SWS | Semester hours |
| PR | Project | R | Seminar Paper and presentation | ECTS | ECTS points in compliance with the European Credit Transfer System |
| S | Seminar | PF | Portfolio | E | Medium of instruction is English |
| P | Practical, exercises | K(xx) | Written examination duration of xx minutes | D | Medium of instruction is German |
| | | M | Oral examination | | |
| | | PA | Practical work (lab, term or seminar paper or project work) | | |
| | | RPA | Practical work documented by a seminar paper and presentation (PF: 50% PA graded and 50% R graded) | | |

### (3) Elective Modules

Individual elective modules are available to students for profile formation. Only those modules can be selected as elective modules which are not identical in content to compulsory subjects or have only a slight overlap in content. In addition, the examination board of the study program can recognize achievements made elsewhere (e.g. tutoring, voluntary work, etc.) upon application by the student in individual cases. The recognition may not exceed five ECTS.

(4) Compulsory practical study semester

The sixth semester is a practical study semester. It can only be taken up if the intermediate examination according to § 7 Section 2 of the General Part of the Study and Examination Regulations has been passed.

The compulsory practical study semester comprises a practical activity in a company, the contents of which must be designed in accordance with the job profile of the course of study. The competencies acquired during the course of study are to be applied and deepened by working on suitable projects in the company. The students should get to know the technical requirements, the working methods and the operational environment in practice and work on applied projects as independently as possible as well as jointly responsible, taking into account the operational conditions.

During the mandatory internship semester, students are supervised by the Internship Office. In order to receive credit for the mandatory internship semester, students must perform various tasks. The Internship Office determines these achievements (e.g. preparation of an interim and a final report) and specifies when and in what form they must be completed. The students are informed about this on the intranet and in an information event.

At the end of the obligatory internship semester, internship days are held in which the obligatory internship semester is followed up and a final presentation is to be given. Participation in the internship days is mandatory.

In exceptional cases, after special approval by the head of the Internship Office, a final presentation set to sound can be made instead of participation in the Internship Days, which can be shown on the Internship Days. The student must arrange for approval of the final presentation by the company.

After completion of the practical work in the company, a record of the work done in the company must be submitted to the Internship Office. On the basis of the services rendered and the proof of activity, the head of the Internship Office decides whether the student has successfully completed the obligatory internship semester.

(5) **Bachelor's** Thesis

The bachelor's thesis can only be started if all study achievements of the first four semesters and the practical study semester have been successfully completed. The topic, task and scope of the Bachelor's thesis are to be limited by the task-setter in such a way that the thesis can be completed in approx. 360 working hours, corresponding to 12 ECTS. The thesis must be submitted to the examination office of Ravensburg-Weingarten University no later than 6 months after the date of issue. Immediately before or after submission of the Bachelor thesis, a colloquium will take place. This serves the presentation of the contents and the central results to the supervisors of the thesis.

The bachelor seminar serves to reflect on the contents of the bachelor thesis in connection with the course contents of the degree program and is conducted by the supervisor of the thesis.

Table 1: Bachelor's Study Program Physical Engineering
First block of studies when starting in winter or summer semester st study stage

| Module | Course | Curricular semester assigned | | | | Ungraded examination | Graded examination |
|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | | |
| | | Type | ECTS/ SWS | ECTS/ SWS | ECTS/ SWS | | |
| Analysis 1 | Analysis 1 | VP | 5/4 | | | | K60 or K90 |
| Linear algebra | Linear Algebra | VP | 5/4 | | | | K60 or K90 |
| Analysis 2 | Analysis 2 | VP | | 5/4 | | | K60 or K90 |
| Numerical Analysis | Numerical Analysis | VP | | | 5/4 | | K60 or K90 |
| Physics 1 | Mechanics and thermodynamics | VP | 5/4 | | | | K90 or MBK 120 |
| Physics 2 | Electrodynamics | VP | | 5/4 | | | K90 or MBK 120 |
| Physics 3 | Optics and Waves | VP | | | 5/4 | | K90 or MBK90[1)] |
| Physics 4 | Quanta | VP | | | 5/4 | | PF or MBK90[1)] |
| | Physics lab | P | | | | | |
| Chemistry | Chemistry | VP | 5/4 | | | | K90 |
| Foreign languages | Professional English or German B2[2)] | V | | | 5/4 | | PF |
| Materials | Materials | VP | | 5/4 | | | K60 |
| Construction 1 | CAD | P | | 5/4 | | | PF |
| | Technical mechanics | VP | | | | | |
| Construction 2 | Machine design | VP | | | 5/4 | | K90 |
| Electrical engineering | Electrical engineering | VP | 5/4 | | | | K90 or PF |
| Electronics 1 | Electronics 1 | VP | | 5/4 | | | K90 or PF |
| | Electrical Engineering / Electronics lab | P | | | | | |
| Electronics 2 | Electronics 2 | VP | | | 5/4 | | K90 |
| Informatic | Computer science basics | VP | 5/4 | | | | K60 or PF |
| | Computer science lab | P | | | | | |
| Software engineering | Software engineering | VP | | 5/4 | | | PA |
| | Software engineering practical course | P | | | | | |
| Summary ECTS / SWS | | | 30/24 | 30/24 | 30/24 | | |

1) can be examined together with the course "Optics and Waves"
2) German-speaking students choose Professional English, English-speaking students choose German

Table 2: Bachelor's Study Program Physical Engineering
Second block of studies at the beginning of the winter semester nd study stage

| Module | Course | Curricular semester assigned | | | | | Ungraded exam. | Graded exam. |
|---|---|---|---|---|---|---|---|---|
| | | | 4 | 5 | 6 | 7 | | |
| | | Type | ECTS/ SWS | ECTS/ SWS | ECTS/ SWS | ECTS/ SWS | | |
| Metrology | Instrumentation and Metrology | VP | 5/4 | | | | | K90 |
| Control Engineering | Control Engineering | VP | 5/4 | | | | | K90 |
| Scientific Working | Scientific Writing | VP | | 5/4 | | | | D or PF |
| | Patents (intellectual property) | | | | | | | |
| Development Methods | Technical Project Management | VP | 5/4 | | | | | PF |
| | Technical Documentation | | | | | | | |
| Business Administration | Business Administration | VP | | 5/4 | | | | K90 |
| Modeling and Simulation | Modeling and Simulation | VP | | 5/4 | | | | K90 |
| Digital Engineering | Digital Engineering | VP | 5/4 | | | | | K90 |
| Photonics 1 | Technical Optics | VP | 5/4 | | | | | K90 or PF |
| Photonics 2 | Machine Vision | VP | | 5/4 | | | | K90 or PF |
| | Machine Vision lab | P | | | | | | |
| Physical Computing | Microcontroller and Sensors | VP | | 5/4 | | | | PF |
| | Microcontroller lab | P | | | | | | |
| Cyber-Physical Systems | Cyber-Physical Systems | VP | 5/4 | | | | | PF or K90 |
| Robotics | Robotics | VP | | 5/4 | | | | PF or K90 |
| Elective module technology | Individual opportunity to deepen studies | | | | | 5/4 | | |
| Elective module Studium Generale | Acquisition of competencies in non-technical areas | | | | | 5/4 | | |
| Project Seminar | Accompanying seminar | S | | | | 5/4 | | PA |
| | Project | PRO | | | | | | |
| Internship Semester | Internship seminar | PRO | | | 30/1 | | | PB |
| Bachelor's thesis and Bachelor's seminar | Bachelor's seminar | S | | | | 3/2 | D | |
| | Bachelor's thesis | B | | | | 12 | | B |
| Summary ECTS/SWS | | | 30/24 | 30/24 | 30/1 | 30/14 | | |

Table 3: Bachelor's Study Program Physical Engineering
Second block of studies at the beginning of the summer semester

| Module | Course | Curricular semester assigned | | | | | Ungraded exam. | Graded exam. |
|---|---|---|---|---|---|---|---|---|
| | | | 4 | 5 | 6 | 7 | | |
| | | Type | ECTS/ SWS | ECTS/ SWS | ECTS/ SWS | ECTS/ SWS | | |
| Metrology | Instrumentation and Metrology | VP | | 5/4 | | | | K90 or PF |
| Control Engineering | Control Engineering | VP | | 5/4 | | | | K90 |
| Scientific Working | Scientific Writing | VP | 5/4 | | | | | D or PF |
| | Patents (intellectual property) | | | | | | | |
| Development Methods | Technical Project Management | VP | | 5/4 | | | | PF |
| | Technical Documentation | | | | | | | |
| Business Administration | Business Administration | VP | 5/4 | | | | | K90 |
| Modeling and Simulation | Modeling and Simulation | VP | 5/4 | | | | | K90 |
| Digital Engineering | Digital Engineering | VP | | 5/4 | | | | K90 |
| Photonics 1 | Technical Optics | VP | | 5/4 | | | | K90 or PF |
| Photonics 2 | Machine Vision | VP | 5/4 | | | | | K90 or PF |
| | Machine Vision lab | P | | | | | | |
| Physical Computing | Microcontroller and Sensors | VP | 5/4 | | | | | PF |
| | Microcontroller lab | P | | | | | | |
| Cyber-Physical Systems | Cyber-Physical Systems | VP | | 5/4 | | | | PF or K90 |
| Robotics | Robotics | VP | 5/4 | | | | | PF or K90 |
| Elective module technology | Individual opportunity to deepen studies | | | | | 5/4 | | |
| Elective module Studium Generale | Acquisition of competencies in non-technical areas | | | | | 5/4 | | |
| Project Seminar | Accompanying seminar | S | | | | 5/4 | | PA |
| | Project | PRO | | | | | | |
| Internship Semester | Internship seminar | PRO | | | 30/1 | | | PB |
| Bachelor's thesis and Bachelor's seminar | Bachelor's seminar | S | | | | 3/2 | D | |
| | Bachelor's thesis | B | | | | 12 | | B |
| Summary ECTS/SWS | | | 30/24 | 30/24 | 30/1 | 30/14 | | |