B.Eng.

International Bachelor of Engineering

Specialization Process Automation Technology

Curriculum

Winter semester 2024/25

Dean of Studies: Prof. Dr.-Ing. Johannes Lindner

Valid for students who have started their studies from winter semester 2022/23 onwards

SPO 2022

'approved by the Faculty Council on July 7th, 2024 '

Preliminary remark

The Faculty of Chemical Technology and Economics (CTW) draws up a study plan (in accordance with § 5 of the study and examination regulations) to ensure the range of courses on offer and to inform students.

The curriculum is adopted by the Faculty Council and published by the university. New regulations are announced at the latest at the beginning of the lecture period of the semester to which they apply for the first time.

The curriculum is subordinate to the following ordinances and statutes:

- Bavarian Higher Education Innovation Act (BayHIG)
- General Examination Regulations of TH Rosenheim (APO)
- Study and Examination Regulations for the International Bachelor of Engineering degree program (SPO)

In particular, the curriculum contains information, regulations and details on:

1. the module plan and curriculum of the International Bachelor of Engineering program,
2. more detailed provisions on proof of performance and participation,
3. compulsory elective modules,
4. the subject-specific elective subjects,
5. the objectives and content of the practical semester and the practical courses as well as their form and organization.

Table of contents

1 Course of study, credit points and module plan

1.1 Course of study and credit points

The Bachelor's degree course in International Bachelor of Engineering – Process Automation Technology has a standard duration of 8 semesters and is designed as a full-time course. It comprises 7 theoretical semesters and one practical semester. The practical semester takes place in the 6th semester. The maximum duration of study is specified by the applicable APO.

The first two semesters are currently held at Campus Rosenheim and largely follow the subjects of the International Bachelor of Engineering at Campus Rosenheim. The same subjects are to be taken and are validated as the respective subject at Campus Burghausen. The exception is Physical Chemistry, which takes place in English online in the first semester instead of Electrotechnics 1. In process automation, it is possible to do Electrotechnics 1 (corresponding to Electrical Engineering 1) in the first semester and do Physical Chemistry later in the studies.

240 ECTS must be completed in the entire Bachelor's degree program. On average, students should take 30 ECTS per semester.

The Bachelor's degree program International Bachelor of Engineering - Process Automation Technology is largely defined by *compulsory modules.* Compulsory modules must be taken by all students. Section 3.1 shows the distribution of these modules.

In addition to the practical semester, numerous laboratory practical courses with an average scope of approx. 7 ECTS per theoretical semester are anchored in the course of study.

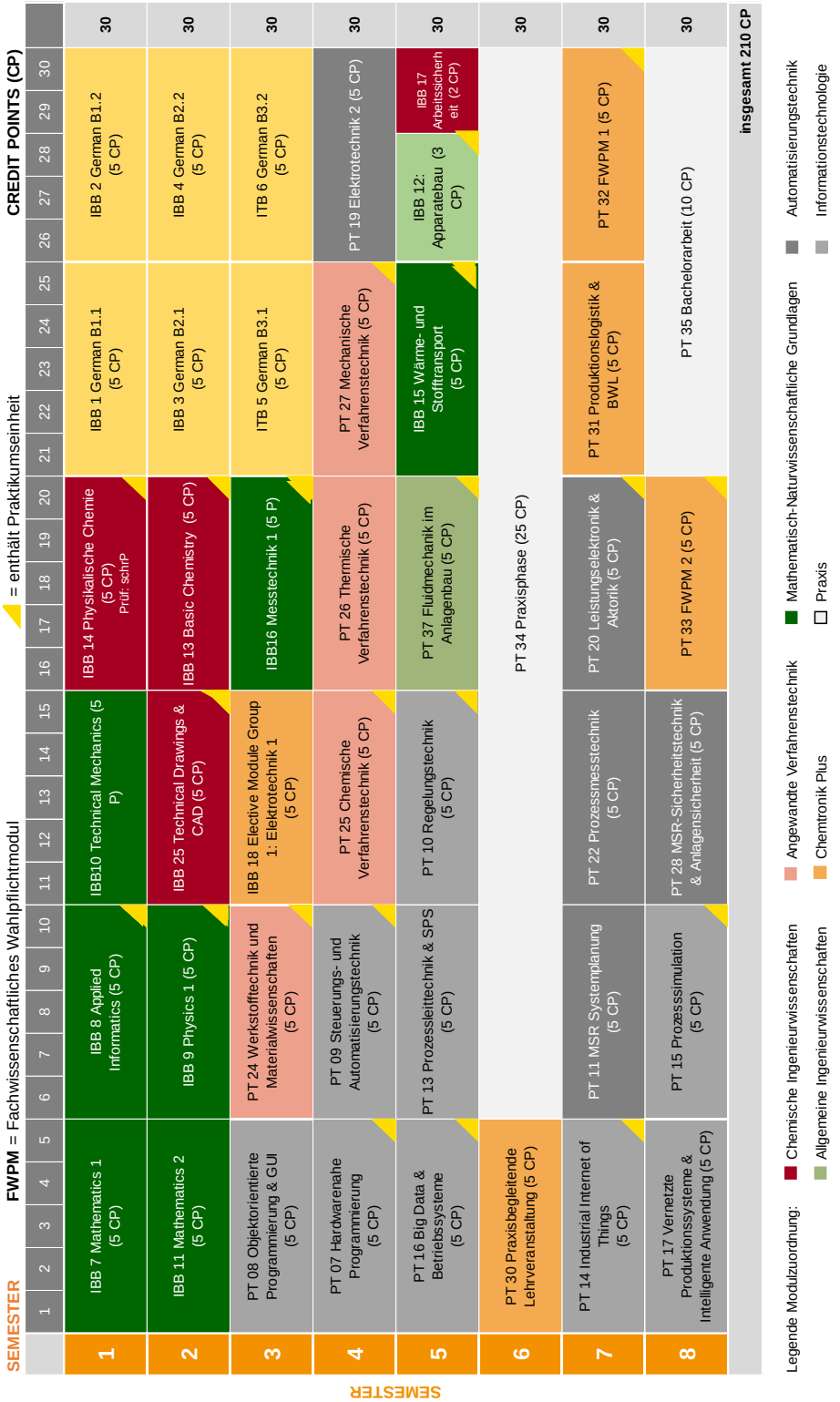
The range of compulsory elective modules (FWPM) is redefined each semester and announced before the start of the semester (for more information, see section 3.3.1).

Information on the *general science electives (AWPM)* can be found in section 3.3.2.

Information on the *compulsory elective modules (WPM)* can be found in section 3.3.3.

The current version of the Study and Examination Regulations (SPO) for the program International Bachelor of Engineering – Process Automation Technology defines the requirements for admission to the 4th semester and the practical semester (6th semester).

1.2 Module plan with details of credit points and examination concept



1.3

2 Examinations

2.1 General information

The current version of the Study and Examination Regulations (SPO) for the International Bachelor of Engineering program regulates the type and scope of examinations in the compulsory modules, compulsory elective modules and compulsory elective modules. The SPO specifies which requirements must be met in order to take individual examinations.[1]

The announcement of the examination modalities in compulsory and elective modules as well as the detailed provisions on the performance and participation certificates is made by posting in the ~~showcases of the Examination Office "Examinations" on the Burghausen campus and / or announcement in the~~ Online Service Center (OSC) of the TH Rosenheim.

If the examination of a module is made up of several partial examinations, the overall grade is generally determined by the arithmetic mean of the individual grades weighted with the credit points (ECTS), whereby each partial examination must be passed with at least a sufficient grade. The overall grade of the completed degree program is also calculated by weighting the respective credit points (ECTS) from the relevant individual modules [see appendix to the SPO].

If examinations leading to final grades are carried out in the form of group work, the individual performances must be clearly distinguishable and assessable.

With regard to repeating examinations, the regulations of the Examinations Office and the higher-level regulations must be observed.

You can find answers to frequently asked questions about examinations (examination period and deadlines, registration for examinations, admission to examinations, inability to take examinations and withdrawal from examinations, examination results, failed and repeat examinations and examination bodies and responsibilities) at:

https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/pruefungen/

2.2 Regulations on admission requirements, aids for examinations and participation in practical courses as part of the course of study

Regulations on admission requirements and permitted aids as well as participation in practicals as part of the degree program are regulated in the announcements of the performance assessments for the respective valid study and examination regulations. ~~Please refer to the announcement at~~

~~https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/formalia/studienregelungen/pruefungsankuendigungen/.~~

[1] e.g. successful completion of practicals as part of the module for admission to the written examination, or passing a written examination is a prerequisite for admission to an examination in a subsequent module.

Further regulations for participation in the following modules:

- PT 04 Apparatus engineering - sub-module PT 04.2 Practical course in apparatus engineering:
  - o Compulsory participation in the practical course of 100%
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 07 Hardware-related programming - Submodule PT 07.2 Practical course in microcontroller technology:
  - o 100% compulsory participation in the practical course
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 08 Object-Oriented Programming & GUI - Submodule PT 08.2 Practicals Object-Oriented Programming & GUI:
  - o Compulsory participation in the practical course of 100%
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 09 Automation Technology & PLC - Sub-module PT 09.2 PLC practical course:
  - o Compulsory participation in the practical course of 100%
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 10 Control Engineering Sub-module PT 10.2 Practical Training in Control Engineering:
  - o 100% compulsory participation in the practical course
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 11 MSR-System planning Sub-module PT 11.2 Practical course in control engineering:
  - o Compulsory participation in the practical course of 100%
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 13 Process control & control technology - sub-module PT 13.2 Practical course in process control technology:
  - o Compulsory participation in the practical course of 100%
  - o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)

- PT 14 Industrial Internet of Things - Sub-module PT 14.2 Industrial Internet of Things practical course :
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 15 Plant Simulation & Systems Process Engineering- Submodule PT 15.2 Practical course in plant optimisation:
  o 100% compulsory participation in the practical course
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 16 Big Data - Submodule PT 16.2 practical course Big Data:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 19 Electrical Engineering 2 - Sub-module PT 19.2 Practical Electrical Engineering:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 20 Control Technology & Actuators- Sub-module PT 20.2 Practical course on fittings:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 21 Measurement Technology 1 - Sub-module PT 21.2 Practical course in metrology:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 24 Materials engineering and materials science - sub-module PT 24.2 Practical course in materials science / materials testing:
  o 100% compulsory participation in the practical course
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 25 Chemical Process Engineering - Sub-module PT 25.2 Practical course in Chemical Process Engineering:
  o 100% compulsory participation in the practical course

o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)

- PT 26 Thermal Process Engineering - Submodule PT 26.2 Practical course in thermal process engineering:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 27 Mechanical Process Engineering - Sub-module PT 26.2 Practical course in Mechanical Process Engineering:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)
- PT 28 MSR safety engineering & plant safety - sub-module PT 28.2 Practical course
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)
- PT 32 FWPM 1 - Elective modules with practical course :
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course attempts by the lecturer)
- PT 33 FWPM 2 - Elective modules with work placement:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course attempts by the lecturer)
- PT 30 Practical course:
  o 80% compulsory attendance
- PT 36 Heat and mass transfer processes - Submodule PT 36.2 Practical course in heat and mass transfer processes:
  o Compulsory participation in the practical course of 100%
  o Test certificates from the practical course (confirmation of participation and successful completion of the practical course experiments by the lecturer)

- PT 37 Plant engineering - Sub-module PT 37.2 Practical training in plant engineering:
  o Compulsory participation in the practical course of 100

o Test certificates from the practical course (confirmation of participation and successful completion of the practical course by the lecturer)

3 Curriculum and modules

3.1 Curriculum

Since not all of the lectures listed are offered every semester, there may be postponements in individual cases.

There is no entitlement to all selectable modules actually being offered. Similarly, there is no entitlement to the corresponding courses being held if there are insufficient participants. Participation in courses may be refused in the curriculum due to limited capacity (in accordance with the APO). ~~Further details will be provided in the **announcements of the performance assessments** for the respective semester of the International Bachelor of Engineering – Process Automation Technology degree program (posted in the "Examinations" display case by the Examinations Office on the Burghausen campus and / or the announcement at https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/formalia/studienregelungen/pruefungsankuendigungen/).~~

The number of students in the practical courses per semester may be limited. The admission requirements are announced at the beginning of each semester.

3.2 Modules and module descriptions

A detailed description of the modules and their sub-modules with the learning objectives / teaching content, lecturer details, semester, SWS and ECTS are described in the module handbook of the International Bachelor of Engineering – Process Automation Technology degree program (see appendix).

3.3 Compulsory elective modules

Compulsory elective subject and compulsory elective module as a compulsory subject

When registering for a certificate of achievement from the published catalogs of compulsory elective modules (PT 32 and PT 33), the corresponding modules are listed as compulsory modules with all the consequences under examination law. Participants in these compulsory modules are listed by name on the corresponding lists of participants and grades.

Modules as voluntary elective modules

If participation in a module is only in the form of a voluntary elective module with no effect on the Bachelor's examination, registration must be waived and an elective certificate form must be submitted to the examiner to document the grade. Participants in such voluntary elective modules are not listed on the corresponding lists of participants and grades. The corresponding transcripts of records are therefore not recorded in the Online Service Center.

An elective module is therefore only included in the Bachelor's examination certificate if the graded elective module certificate is submitted to the Examinations Office at the latest before the last performance record in a compulsory module required for the Bachelor's examination is taken.

3.3.1 Subject-specific compulsory elective modules (FWPM)

Building on the course content of the previous semesters, compulsory elective modules are offered in the 7th and 8th semesters for individual in-depth study. The range is adapted to current requirements each semester. An overlap in the timetabling of individual compulsory elective modules with each other or with compulsory lectures cannot be ruled out.

The first modules that are reported to the Examination Office are relevant for grading in chronological order until the number of required ECTS is reached or exceeded for the first time. Additional modules can be included in the certificate as elective modules upon request.

The choice of FWPM for the following semester takes place at the end of the previous semester. The selection of FWPMs takes place in the community (FWPM selection). You will receive the necessary information during the respective semester. FWPMs take place subject to a sufficient number of participants. The number of participants for the FWPM is limited.

Subject catalog FWPM				
Module no.	*Designation*	*Type of course*	*SWS / credit points*	*Temporal position*
PT 32[2]	*FWPM I:* ▪ *Modules of the subject catalogue PT 32 - see module handbook PAT* ▪ *PT32.1 (=B 30.1) FWPM Trade fair** ▪ *In addition, modules from the subject catalog B 30- see module handbook BWT (take place regularly in the winter semester)*	*SU, Ü, PA, Pr*	*4 SWS / 5* ECTS	*7th semester, at the earliest from the start of the 4th semester**
PT 33	*FWPM II:* ▪ *Modules of the subject catalog PT33 - see module handbook PAT*	*SU, Ü, PA, Pr*	*4 SWS / 5* ECTS	*8th semester, at the earliest from the start of the 5th semester**

3.3.2 General science electives

General science electives are not currently included in the curriculum.

3.3.3 Compulsory elective modules

Compulsory elective modules are not currently included in the curriculum.

3.4 Electives

Electives can be taken voluntarily. If successfully completed, these can be listed in the Diploma Supplement.

4 Practical phase / Practice semester

4.1 Training plan for the practical phase

The practical phase (module PT 34) is accompanied by module PT 30 "Practical course" with a preparatory introductory block before and a final block (presentation of internship report) after the practical semester.

[2] Any combination of sub-modules is possible in order to achieve a total of at least 5 ECTS. When combining individual modules with a total of more than 5 ECTS (e.g. 3 + 3), the overall grade for the module is calculated from the weighted average.

Successful participation in all parts of modules PT 30and PT 34is a prerequisite for recognition of the practical semester!

(1) Time scope and timing

18 weeks of practical work and practical course (PT 30 Practical course (4 SWS))

Practical semester				
Module no.	Designation	Temporal position	Duration	ECTS
PT 30	Practical course (part 1)	5th semester	2 SWS	
PT 34	Practical phase	6th semester	18 W.	25
PT 30	Practical course (Part 2: Presentation of the internship report)	7th semester	2 SWS	5

(2) Training centers and training content

The practical semester must be completed in a suitable company in which challenging activities are carried out or challenging projects are worked on that provide a broad insight into the work of a process automation engineer, for example in the areas listed below:

- Analytics and quality assurance
- Maintenance
- Project engineering
- Process development
- Industrial engineering
- Research and development
- Approval procedure/authority management
- Technical sales of chemical products and process engineering equipment and systems
- Plant construction and commissioning

The Internship **Office** maintains a **list of companies** that have already accepted students from TH Rosenheim for an internship semester in the past and therefore meet the basic requirements for a company for the internship semester. The internship semester can of course also be completed at other companies not included on this list - in this case, however, the prior approval of the internship coordinator is required. In any case, however, it must be ensured that the student is employed in an area of responsibility that matches the subject focus of the Chemical Engineering degree program.

In addition, companies publish current **offers for students on the online platform of the Technical University's Career Service** at:

https://www.th-rosenheim.de/studium-und-weiterbildung/im-studium/kurs-programm-und-zusatzangebote/career-center

If the internship semester is to be completed abroad, the International Office of TH Rosenheim must be contacted at an early stage.

(3) Training objective

- Insight into engineering activities through specific tasks and practical solutions to tasks in the field of process automation technology
- Insight into the technical and organizational contexts and sociological problems of the company. Familiarization with engineering activities from the fields of chemistry, plant design and applied process engineering etc. to promote an interdisciplinary view and the possibility of critical questioning, e.g.
  - What is the best chemical route?
  - Is the technology sufficiently mature?
  - Is the project worthwhile and what risks need to be considered?
  - How can laboratory results be put into practice? What needs to be taken into account?
- Application and consolidation of the knowledge and skills acquired during previous training

(4) Evidence required

- Training contract in accordance with the requirements of the Internship Office
- Internship report based on scientific working techniques
- Certificate from the company confirming successful completion of the practical semester (practical phase)

(5) Proof of performance for module PT 34"Practical phase"

- 10-minute presentation (for more details see chapter 4.3PT 30)
- Internship report and internship certificate: Criteria relevant to passing the course are the timely submission of the internship report and the internship certificate from the supervising company as well as the assessment of the internship report as "successfully completed".

4.2 Requirements for the internship report

In accordance with the General Examination Regulations (APO), the student is obliged to prepare a report in due time in accordance with the Faculty Council, in which the progress of the practical training can be seen.

The timely submission as well as the form and content of the report will be taken into account when deciding on the successful completion of the practical semester.

(1) Submission of the report

The reports must be submitted to the Internship Office on the Burghausen campus. The latest submission deadline is announced by the Internship Office each semester. See also: https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/praxissemester-praktika/→ "Dates in the practical semester" → Schedule for the respective winter semester / summer semester

(2) External form and layout of the report

The report must be reviewed by the internship office and lecturers in specified sections within a short processing period. For this reason, the external form must be suitable for quick distribution:

In a loose-leaf binder (A4 format, not bound, no folders), please insert in the following order:

1. Cover sheet (form cover sheet overall report)→ Template see link to the Internship Office
2. Form(s) "Certificate" of the training position(s)→ Template see link to the Internship Office
3. Affidavit (template see link to the Internship Office)
4. One page company and activity description [3]
5. An independently written report (signed on the last page by the company's instructor and the student) must be submitted in German or, alternatively, in English. The summary must be written in German and English).

The report and the company and activity description including appendix must be submitted in printed form to the Internship Office at the Burghausen Campus.

The forms can be found at: https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/praxissemester-praktika/

The instructions for preparing the report can be found in the guidelines for academic work at the Burghausen campus: https://learning-campus.th-rosenheim.de/course/view.php?id=6676

[3] The company/job description should contain the most important information/characteristics about the company. Furthermore, the most important activities in which the student was involved are listed here in keywords. Finally, a short statement about the company and the internship from the student's point of view. This page is not signed off by the company.

(3) Structure and scope

The report serves to check whether the trainee has dealt in depth with process automation technology issues in practice in accordance with the objectives. The report must show that the task was carried out in a predominantly independent, engineering-like manner. It is assumed that the report meets the requirements for scientific work.

The report must **be** at least 20 pages and no longer than 30 pages DIN A4. This may also include documents that the trainee has prepared independently for the training company (but at least 5 pages of new work according to the above structure). Company and office documents (information leaflets, brochures, plans, etc.) may be added to the report. As with the drafting of the report, care must be taken to ensure that the confidentiality obligation is not breached. Such additions are not counted towards the required minimum scope of the overall report. All documents in the report must be listed on the cover sheet.

The report builds on the specialist knowledge gained at the end of the 5th semester, i.e. the reader does not have to repeat any connections known from their studies, but can take them for granted!

The following **structure** is recommended for the report:

- Task and objective
- Preparatory work (evaluation of literature and standards, data procurement, work equipment, planning of implementation)
- Execution of the task
- Results and findings
- Critical statement, conclusion, possibly outlook (suggestions for improvement)
- References and sources

The report has its own **cover sheet** (see "Cover sheet internship report" at https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/praxissemester-praktika/) with at least the following information:

- Name of the intern
- Internship company, department, supervisor
- Topic of the report and associated module from the curriculum

4.3 Practical course (PT 34)

The practical semester is accompanied by an introductory block (in the 6th semester) and a final block (in the 8th semester). All events will be announced in good time. This also includes participation in the final block of students from the previous practical semester (PT 34) as an audience member.

The introductory block serves to convey the subject area of the practical course for everyday working life. The introductory block consists of the following parts:

- Participation (as an audience member) in the final block of students from the previous practical semester at the beginning of the 5th semester
- Participation in the PT 34 module during the 5th semester on various topics in preparation for practical work

The final block consists of a 10-minute presentation followed by a professional feedback discussion (max. 5 minutes) on the activities during the internship semester or training.

5 Bachelor thesis

5.1 General conditions

The requirements for registration, examiner selection, completion time, return of the topic, submission and presentation of the Bachelor's thesis and academic degree and Bachelor's examination certificate are regulated in the following examination regulations:

A) General Examination Regulations (APO) of TH Rosenheim in the latest version

B) Study and Examination Regulations (SPO) for the Bachelor's degree program International Bachelor of Engineering at TH Rosenheim in the latest version

The current versions of the examination regulations are available on the homepage of TH Rosenheim. Students are obliged to familiarize themselves independently with the requirements for writing a thesis in the above-mentioned examination regulations.

5.1.1 External bachelor theses

The implementation of projects as part of final theses in or for companies and authorities is a long-standing practice at TH Rosenheim. It is welcomed and encouraged for mutual benefit. The following points must be observed for external bachelor theses:

The company should grant access to the two auditors at their request so that they can inform themselves on site about the subject matter and progress of the work.

In the event of additional supervision by an external institution, this institution must be consulted for coordination purposes and a signature must be obtained.

5.1.2 Registration of a Bachelor thesis

The student independently chooses the topic and the two examiners, i.e. agrees the title and content of the topic with them.

You can register your Bachelor's thesis online using the web forms provided by TH Rosenheim:

https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/abschlussarbeiten/

With regard to registration, the regulations set out in the applicable APO must be observed.

5.1.3 Requirements for the Bachelor thesis

The **completed Bachelor's thesis** must contain the following:

- Please note the supplement under the following link:
  https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/abschlussarbeiten/

- A cover sheet in accordance with Annex 4 of the General Examination Regulations of TH Rosenheim must be used when writing a thesis. You can find a corresponding template under 'Word template for academic papers' in the Learning Campus (https://learning-campus.th-rosenheim.de/course/view.php?id=6676).
- Theses must be accompanied by a declaration from the student that they have written the thesis independently, have not yet submitted it elsewhere for examination purposes, have not used any sources or aids other than those specified and have marked verbatim and analogous quotations as such.
- A half-page abstract of the paper in German and English before the table of contents, as well as 3 to 5 keywords on the content of the paper
- Text pages with numbered pages, illustrations, tables and references
- Attached drawings and tables must be folded according to standards and enclosed in a glued-in pocket.
- Compilation of the literature used (journal articles, books, Internet, etc.)
- The completed thesis (with appendix) must be uploaded to the document management system for theses (DMS) via the university's website in the form of a single pdf file. In addition, a bound copy (no spiral binding) including appendix and, if applicable, including calculation files in Excel format or results from industry software etc. must be handed over to the examiners, provided they declare this when agreeing to be appointed as examiners. The time of uploading the file to the DMS is decisive for meeting the submission deadline. The bound copy (if requested by the examiners) must also be submitted to the examiners by the latest submission date.
- The files are temporarily stored in the DMS and deleted from the server after 2 years. The bound copies of the Bachelor's thesis remain with the two examiners after the grades have been announced.

5.1.4 Assessment of the Bachelor thesis

The following criteria are used to assess the Bachelor's thesis:

- Structuring the work
- Content quality of the elaboration
- Applied methods and theories
- Independence of the problem solution
- Degree of novelty and complexity of the task
- Linguistic and formal quality of the elaboration
- Literature research and processing

5.1.5 Submission of the Bachelor thesis

The Bachelor's thesis must be uploaded to the DMS in pdf format by the deadline. Depending on the information provided by the examiners, additional bound copies (no spiral binding) incl. appendix and, if applicable, incl. calculation files in Excel format or results from industry software etc. must be submitted to the examiners by the deadline.

5.2 Presentation / oral examination

The results of the Bachelor's thesis are presented in the presentation. The presentation should show that the student can discuss scientific questions and present results clearly. The oral examination must be held after submission of the Bachelor's thesis (usually **within 4 weeks)**.

The presentation, including the subsequent discussion, lasts **30 minutes** and is taken into account in the assessment of the Bachelor's thesis.

Students on the same degree program may attend the presentation as an audience member, subject to availability. Participation does not extend to the discussion. The public may be excluded from the presentation for important reasons or at the candidate's request.

5.3 Bachelor's certificate and academic degree

If all examinations have been passed and the Bachelor's thesis has been graded at least "sufficient", the graduate will receive a **certificate** shortly after the presentation, in which all coursework completed is listed together with the respective credit points. Grades are listed for the coursework in connection with which the graduate has taken a course-related examination. The certificate also contains the topic and grade of the Bachelor's thesis as well as the overall grade. The certificate is signed by the Chair of the Examination Board. The graduate also receives a diploma supplement in English.

When the certificate is issued, graduates of the Bachelor's degree program are awarded the **academic degree** "Bachelor of Engineering", abbreviated to "B.Eng." is awarded.

6 Contact persons

Contact person	**Function**	**Area of responsibility** (see also Rules of Procedure of the Faculty CTW)
Dominik Pentlehner Dominik.Pentlehner@th-rosenheim.de Phone +49 8031 805 4020	**Dean Faculty CTW**	Represents the faculty, decides on faculty positions, ensures the professional structure and content of the study programs and their compliance
Edda Kremper Edda.Kremper@th-rosenheim.de Phone +49 8031 805 4002 Fax: +49 8031 805 4001 Diana Mödl Diana.Moedl@th-rosenheim.de Phone +49 8031 805 4003 Tamara Siegert tamara.siegert@th-rosenheim.de Phone +49 8031 805 4005	**Secretariat Faculty CTW**	Administration and organisation Incl. lecture organisation, room and appointment postponements
Johannes Lindner Johannes.Lindner@th-rosenheim.de Phone +49 8031 805 4024	**Dean of Studies**	Organization and coordination of the degree program and proposals for the content of the degree program
Franziska Wohlfart franziska.wohlfart@th-rosenheim.de Phone +49 8031 805 2843	**Study program assistant**	Contact for students, lecturers and professors Administrative tasks within the framework of the study program organization
Dominik Pentlehner Dominik.Pentlehner@th-rosenheim.de Phone +49 8031 805 4020	**Student advisory service**	Supporting students in selecting and attending courses appropriate to their goals
Arno Bücken arnold.buecken@th-rosenheim.de Phone +49 8031 805 4035	**Chair of the CTW Faculty Examination Board**	Examination matters, application for crediting of examinations, final theses (approval of registration and extension of Bachelor theses)

Contact person	**Function**	**Area of responsibility** (see also Rules of Procedure of the Faculty CTW)
Johannes Völkl johannes.voelkl@th-rosenheim.de Phone +49 8031 805 4037	**Representative for the practical semester**	Contact for internships Module CI 137

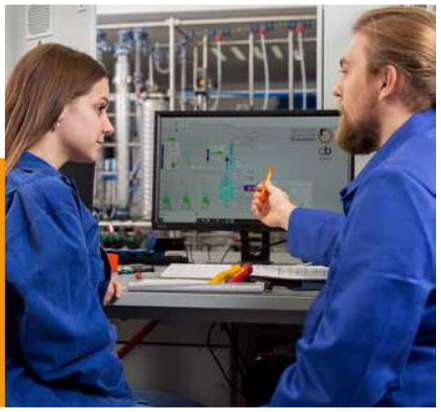
Silvia Seibold Silvia.Seibold@th-rosenheim.de Phone +49 8031 805 4022	**International Representative Faculty CTW**	Contact person for stays abroad as part of your studies (for all degree programs at the Faculty of CTW)
Werner Thar Werner.Thar@th-rosenheim.de Phone +49 8031 805 4025	**Head of Examination and Study Affairs Faculty CTW**	Contact internship office, examination office, study office
Sibylle Möbius International@th-rosenheim.de Phone +49 8031 805 2118	**International Office of the TH Rosenheim**	Advice on issues relating to semesters abroad and internships abroad
Ferdinand Bär Studienberatung@th-rosenheim.de Phone +49 8031 805 2489	**Central Student Advisory Service of the TH Rosenheim**	Information and advice on all aspects of studying for students, pupils, prospective students from practice, high school graduates, teachers or parents

7 Appendix Module Handbook h CHE

B.Eng.

International Bachelor of Engineering – Specialisation Process Automation Technology

Studiengangsleitung: Prof. Dr.-Ing. Johannes Lindner



Modulhandbuch

Diese Version wird sukzessiv mit den jeweils verantwortlichen Lehrenden weiterentwickelt. Dies gilt für die Lehre und die Praktika. Inhalte und Regelungen korrespondieren mit dem Studienplan und der Prüfungsordnung

Inhaltsverzeichnis

Abkürzungsverzeichnis

Abkürzung	Definition
B.Eng.	Bachelor of Engineering
BA	Bachelorarbeit
BWL	Betriebswirtschaftslehre
CHE	Chemieingenieurwesen (Abkürzung hochschulintern)
CI	Chemieingenieurwesen (Abkürzung laut Curriculum)
CP	Credit Point / Leistungspunkt
CT	Chemtronik (Abkürzung laut Curriculum)
CTR	Chemtronik (Abkürzung hochschulintern)
DV	Datenverarbeitung
ECTS	European Credit Transfer System
Ex	Exkursion
FEM	Finite-Elemente-Methode
FWPM	Fachwissenschaftliches Wahlpflichtmodul
FOS/BOS	Fachoberschule / Berufsoberschule
HS	Hochschule
mdlP	Mündliche Prüfung
P	Prüfungen
PB	Praxisbericht
Pr	Praktikum
PStA	Prüfungsstudienarbeit
S	Seminar
schrP	Schriftliche Prüfung
SPO	Studien- und Prüfungsordnung
SU	Seminaristischer Unterricht
SWS	Semesterwochenstunden
TH	Technische Hochschule
TN	Teilnahmenachweis
Ü	Übung
UT	Umwelttechnologie (Abkürzung laut Curriculum)
UWT	Umwelttechnologie (Abkürzung hochschulintern)

Studien- und Prüfungsordnung

Die jeweils aktuelle Studien- und Prüfungsordnung kann auf der Homepage der Technischen Hochschule Rosenheim unter

https://www.th-rosenheim.de/home/infos-fuer/studierende/studienorganisation/formalia/studienregelungen/studien-und-pruefungsordnungen/

eingesehen werden.

Modulpläne und -Beschreibungen

Modulplan Prozessautomatisierungstechnik

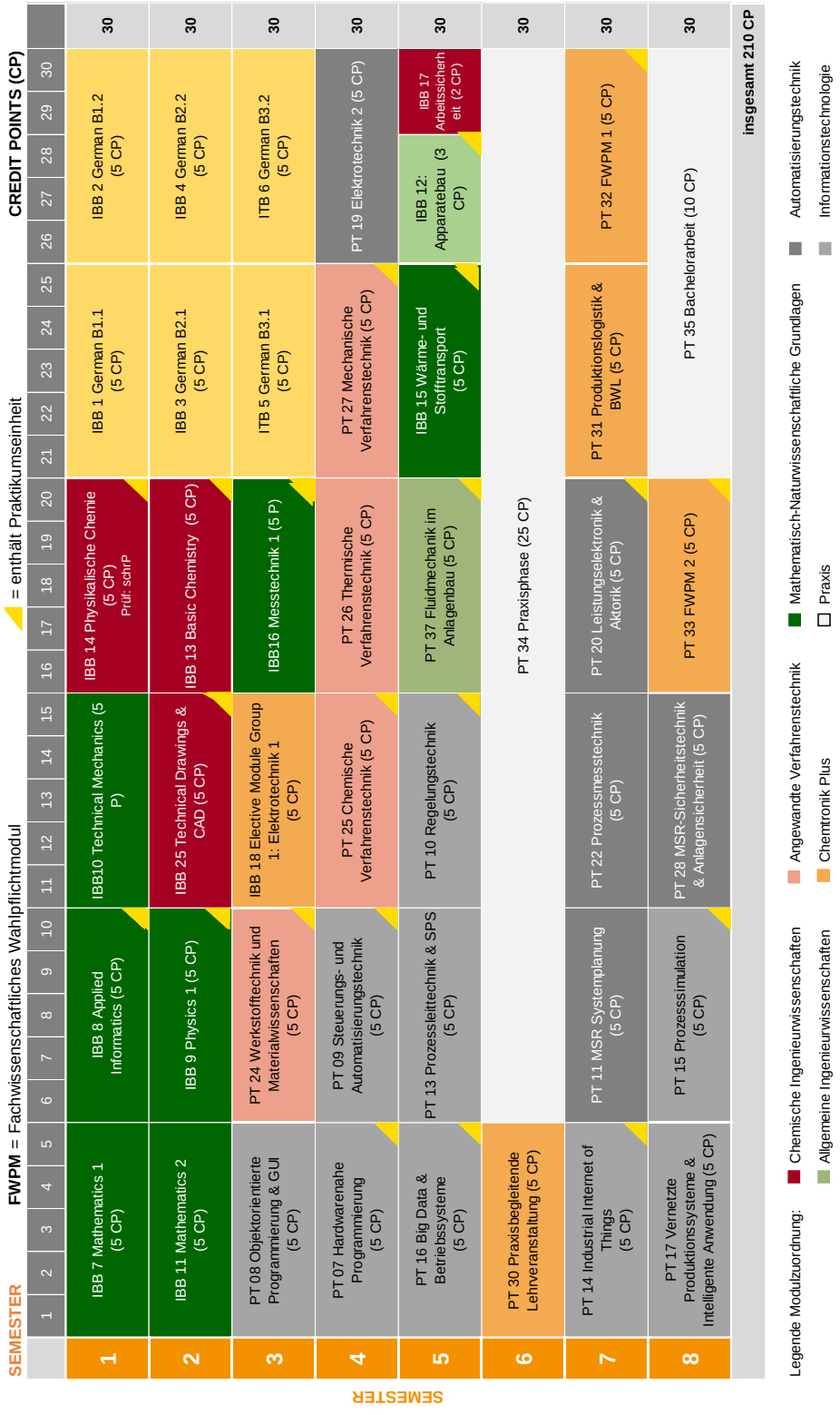


Abbildung 1: Modulplan mit Credit Points (CP) für die Studienrichtung Chemtronik

Studenten, die ihr Studium zum SS 2024 aufgenommen haben, folgen dem Studienplan zur SPO Prozessautomatisierungstechnik in der Satzung von 2024.

Modulbeschreibungen

Im Folgenden sind die einzelnen Module sowie Teilmodule des Studiengangs Prozessautomatisierungstechnik aufgeführt. Für jedes Modul bzw. Teilmodul werden folgende Punkte angegeben bzw. beschrieben:

- Modulnummer und Bezeichnung sowie Modulverantwortlicher
- Studiengang
- Zielgruppe/Semesterlage/Häufigkeit
- Verwendbarkeit des Moduls
- Lernziel des Moduls bzw. Kompetenzen
- Referenten
- Credit Points (ECTS)
- Semesterwochenstunden (SWS)
- Gesamtworkload / Aufteilung der Stunden pro Modul bzw. Teilmodul
- Prüfungsleistung und Leistungsbewertung auf Modulebene (d.h. Zusammensetzung der Modulnote bzw. Verrechnung von Teilprüfungen)
- Kursvoraussetzungen
- Modulinhalte
- Art der Lehrmethode sowie Unterrichtssprache
- Prüfungsleistung und Leistungsbewertung auf Modulebene bzw. Teilmodulebene
- Zulassungsvoraussetzungen zur Prüfung
- Hilfsmittel in der Prüfung*
- Literatur

Diese Auflistung ermöglicht einen schnellen Überblick über die jeweiligen Module des Studiengangs Umwelttechnologie (B. Eng.).

*) Hinweis: Beachten Sie dazu unbedingt die Aushänge - im Schaukasten „Prüfungen“ am Campus Burghausen und / oder die Bekanntmachung unter https://www.throsenheim.de/home/infosfuer/studierende/studienorganisation/formalia/studienregelungen/pruefungsankuendigungen/

- nur diese sind rechtlich verbindlich!

Module 1. Semester

Module name	German B1.1		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR11 (IBB 1)		1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Zentgraf	Frau Hausner	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer semester	German / Englisch
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	60 h	30 h

Applicability of the module in the degree programmes
IBE
Mandatory requirements according to examination regulations
-
Recommended prerequisites
A2 completed according to CEFR
Intended learning objectives
Advanced language use B1.1 according to CEFR Students will be able to • Understand frequently used expressions and clear standard language related to study, work and leisure. • Cope with most everyday situations in the language area • Express themselves simply and coherently on familiar topics and areas of personal interest • Report on experiences and events • Describe hopes and goals • Give brief reasons and explanations for plans and views.
Content
Level B1.1 • Teaching and examination focus: Speaking and listening comprehension • Practical language skills for study and everyday life • Present • Vocabulary and grammar • Pronunciation • Intercultural competence

Recommended literature
• To be announced in the course

Module name	German B1.2		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR12 (IBB2)		1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Zentgraf	Frau Hausner	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer semester	German / Englisch
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	60 h	30 h

Applicability of the module in the degree programmes
IBE

Mandatory requirements according to examination regulations
-

Recommended prerequisites
A2 completed according to CEFR

Intended learning objectives
Advanced language use B1.2 according to CEFR Students will be able to • Understand frequently used expressions and clear standard language related to study, work and leisure. • Cope with most everyday situations in the language area • Express themselves simply and coherently on familiar topics and areas of personal interest • Report on experiences and events • Describe hopes and goals • Give brief reasons and explanations for plans and views.

Content

Level B1.2

- Teaching and examination focus: Writing and reading comprehension
- Practical language skills for study and everyday life
- Mails and written communication
- Vocabulary and grammar
- Intercultural competence

Recommended literature
• To be announced in the course

Module name	**Mathematics 1.1**		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR13 (IBB 7)	Maths 1.1	1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Link	Prof. Dr. Link, Dr. Douka	SU	5
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer Semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	54 h	36 h
Applicability of the module in the degree programmes			
IBE			
Mandatory requirements according to examination regulations			
none			
Recommended prerequisites			
General higher education qualification (Abitur), advanced technical college certificate (Fachhochschulreife) or equivalent			
Intended learning objectives			
The aim is to teach and deepen mathematical basics and their applications. The students are then able to formulate practical problems mathematically and solve them by selecting suitable methods. Due to the knowledge of mathematical basics, the students are able to independently deal with more advanced mathematical methods.			
Brief description of the module			

The students master the basics of linear algebra and vector calculus. They know the basics of calculus, can confidently deal with functions of a variable and are proficient in differential and integral calculus in a variable. They can handle and apply complex numbers.

Content

Lecture:

- Basics
- Linear algebra
- Differential and integral calculus of a variable
- Introduction to complex numbers

Exercises

Exercises accompanying the lectures

Recommended literature

- G. James, P. Dyke: Modern Engineering Mathematics, Pearson, 6th edn. , 2020
- G. James, P. Dyke: Advanced Modern Engineering Mathematics, Pearson, 4th edn. , 2011
- E. Kreyszig,: Advanced Engineering Mathematics, John Wiley & Sons, 10th edn. , 2011

Module name	**Physical Chemistry**		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBB14	PC	1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Pentlehner	Dr. Oscar Rojas,	SU	5
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer Semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	75 h	40 h	35 h

Applicability of the module in the degree programmes

IBB

Mandatory requirements according to examination regulations

none

Recommended prerequisites

General higher education qualification (Abitur), advanced technical college certificate (Fachhochschulreife) or equivalent

Intended learning objectives
The students are familiar with the elementary principles and concepts of general and physical chemistry. Students are able to understand, reproduce and apply the basic concepts and models of chemistry. They are able to fundamentally interpret the influence of physical quantities on chemical reactions. The students have a basic knowledge of the most important concepts in chemistry, which serve as a basis for further chemical subjects. They know the smallest building blocks of chemistry, atoms, the structure of matter and the most important boundary concepts of bonding forms. Furthermore, students can assess the fundamentals of quantum mechanics based on key experiments and the derived consequences. These are a prerequisite for the following discussion of the advantages and limitations of various models of chemical bonding and matter in general. Through an introduction to reaction kinetics, students have a basic understanding of the process of chemical reactions, which serves as the basis for the chemical engineering courses. Based on basic knowledge of thermodynamics, students understand chemical processes and in particular chemical equilibrium and can derive and calculate their targeted influence. The students deepened the content of the lecture by independently working on application-oriented exercises. The students are able to present and discuss their solution approach.

Content

1. Basics of quantum mechanics and structure of matter
    - Light and waves, atomic spectra, photo effect, Franck-Hertz experiment, wave-particle dualism, Bohr's atomic model, Schrödinger equation, structure of the electron shell and PSE: structure, trends, systematics
2. Chemical bonding and molecules (see also module CI 107)
    - Schrödinger equation for molecules (H2+, H2, ..), LCAO-MO method,
    - Types of bonding (ionic, covalent and metallic bonding)
    - VSEPR, intra- and intermolecular bonds, octet rule, notation, isomerism
    - MO theory and hybridization, heteronuclear bonding • Metallic bonding, metals and semiconductors
3. Introduction to reaction kinetics
    - Terms and definitions
    - Formal kinetics, reactions of different orders
    - Pressure and temperature dependence
    - Methods for determining kinetics (e.g. concentration measurement)
    - Reaction coordinates and profiles, transition state theory, catalysis
4. Introduction to (chemical) thermodynamics
    - Terms and definitions (system, state variables)
    - Reaction enthalpies, standard enthalpies of formation
    - Second law, entropy (statistical and thermodynamic interpretation), entropy of mixture
    - Third law, equilibrium and law of mass action, chemical potential, Le Chatelier
    - free energy and the connection to phase equilibria,
    - Applications, e.g. precipitation, complex formation, acid-base and redox reactions as well as adsorption, extraction and ion exchange processes; Chromatography
    - Interaction of kinetics and thermodynamics

Recommended literature

- Atkins, P. et al. (2006): Chemie. Einfach alles. Wiley-VCH-Verlag
- Atkins, P. (2013): Physikalische Chemie. Wiley-VCH-Verlag, 5. Auflage, ISBN 978-352-7-33247-2
- Mortimer, C. E., Müller, U. (2015): Chemie. Georg Thieme Verlag, 12. Aufl.
- Otto, M.: Analytische Chemie. Wiley-VCH
- Riedel, E. (2013): Allgemeine und Anorganische Chemie. De Gruyter Verlag, 11. Aufl.
- Riedel, E. (2013): Allgemeine und Anorganische Chemie – Übungsbuch. De Gruyter Verlag, 11. Aufl.
- Wedler (2012): Lehrbuch der Physikalischen Chemie (mit Übungsbuch). Wiley-VCH

Module name	Applied Informatics		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR15 (IBB 8)	AppInf	1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Klein	Prof. Dr. Klein	SU,Pr	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer Semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	54 h	36 h

Applicability of the module in the degree programmes

IBE

Mandatory requirements according to examination regulations

none

Recommended prerequisites

none

Intended learning objectives

After successful participation in the course, students are able to

- Understand the basic functioning of a computer
- Understand the computer's internal number representation and use the correct basic data types.
- produce programmes of medium complexity using control structures and functions and observing quality criteria (readability, maintainability and reusability).
- Design and implement algorithms
- use the version management tool Git
- use the C standard library
- analyse and evaluate other people's source code

Brief description of the module

The students learn the basics of procedural programming using the C language. In this context, the basics of computer architecture including memory model and data types are also taught. After successful participation, the students are able to design algorithms and implement programmes using control structures, functions and observing quality criteria.

Content
• Introduction to computer architecture and memory model • Number systems, coding • Basic data types and arrays • Version management using Git • Control structures • Functions • Arithmetic, bitwise and Boolean operators • C standard library
Recommended literature
• B. Kernighan, D. Ritchie: Programmieren in C. ANSI C, Carl Hanser, 2.Auflage, 1990 • H. Erlenkötter: C:Programmieren von Anfang an, Rowohlt Taschenbuch, 25.Auflage, 1999 • A. Böttcher, F. Kneißl: Informatik für Ingenieure, Oldenbourg Verlag, 3.Auflage, 2012

Module name	**Engineering Mechanics 1: Statics**		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR16 (IBB 10)	Statics	1	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Schinagl, Prof. Dr. Wagner	Prof. Dr. Schinagl, Prof. Dr. Wagner	SU, Ü	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Summer semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	54 h	36 h
Applicability of the module in the degree programmes			
IBE			
Mandatory requirements according to examination regulations			
none			
Recommended prerequisites			
Knowledge of mathematics and physics according to the contents of the FOS-Technology course or the Abitur (A-levels).			

Intended learning objectives

After successful participation in the module courses, students are able to

- apply engineering-recognised methods of rigid-body statics to analyse technical components and assemblies under point and distributed loads with regard to internal and external forces, moments and their local curves.
- structure practical technical-mechanical systems.
- use the mathematical relationships generated with it for calculations.
- understand important special cases and apply the methods learned to them.
- document the methodical procedure for solving problems from structural analysis in a form-appropriate and comprehensible manner.

Brief description of the module

The course “Statics” is the first and essential part of technical mechanics. Here, the basics and methods for the calculation of internal and external forces and moments on static single and multi-body systems are taught. These basics are based on the equilibrium of forces and moments, which leads to mathematical equations and their solution via the free-cutting method. Important special cases, such as surface or wrap-around friction or distributed loads, are taken into account. Statics forms the basis for many other engineering fields and teaching modules.

Content

- Terms, basic laws, basic tasks of statics
- Central, plane force system
- Force, force couple and moment of a force
- Resultant force of a non-central planar force system
- Stock reactions
- Spatial force system
- Focus
- Internal forces and moments, internal force curves also under distributed loads
- Friction

Recommended literature

- Skript and Formulary
- M.Mayer: Technische Mechanik, Carl Hanser, 9th Edition, 2021
- D.Gross, W.Hauger, J.Schröder, W.A.Wall: Technische Mechanik 1:Statik, Springer Vieweg, 14th Edition, 2019
- C. Eller: Holzmann/Meyer/Schumpich Technische Mechanik Statik, Springer Vieweg, 15th Edition, 2018
- R.C. Hibbeler: Engeneering Mechanics: Statics, Pearson, 15th Edition, 2022
- D. Gross et. Al.: Statics – Formulas and Problems: Engineering Mechanics 1, Springer, 1st Edition, 2022

Module 2. Semester

Module name	German B2.1		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR21 (IBB 3)		2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Zentgraf	Frau Hausner	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Winter semester	German / English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	60 h	30 h
Applicability of the module in the degree programmes			
IBE			
Mandatory requirements according to examination regulations			
-			
Recommended prerequisites			
B1 completed according to CEFR			
Intended learning objectives			
Independent language use B2 according to CEFR Students can • Understand the main contents of complex texts on concrete and abstract topics and on technical discussions in their own field of specialisation. • Communicate so spontaneously and fluently that a conversation with a native speaker is possible without much effort on either side. • Express themselves on a wide range of topics • Explain a point of view on a current issue and state the advantages and disadvantages of different options.			

Module name	German B2.2		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR22 (IBB 4)		2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Zentgraf	Frau Hausner	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Winter semester	German / English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	60 h	30 h

Applicability of the module in the degree programmes

IBE

Mandatory requirements according to examination regulations

-

Recommended prerequisites

B1 completed according to CEFR

Intended learning objectives

Independent language use B2 according to CEFR Students can

- Understand the main contents of complex texts on concrete and abstract topics and on professional discussions in their own field of specialisation.
- Communicate so spontaneously and fluently that a conversation with a native speaker is possible without much effort on either side.
- Express themselves on a wide range of topics
- Explain a point of view on a current issue and state the advantages and disadvantages of different options.

Content

Level B2.2

- Teaching and examination focus: Writing and reading comprehension
- Practical language skills for study and everyday life
- Writing an internship report
- Vocabulary and grammar
- Intercultural competence

Recommended literature

- To be announced in the course

Module name	Mathematics 1.2		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR23 (IBB 11)	Maths 1.2	2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Link	Prof. Dr. Link, Dr. Douka	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Winter Semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	54 h	36 h

Applicability of the module in the degree programmes

IBE

Mandatory requirements according to examination regulations

none

Recommended prerequisites

General higher education qualification (Abitur), advanced technical college certificate (Fachhochschulreife) or equivalent

Intended learning objectives

The aim is to teach and deepen mathematical basics and their applications. The students are then able to formulate practical problems mathematically and solve them by selecting suitable methods. Due to the knowledge of mathematical basics, the students are able to independently deal with more advanced mathematical methods.

Brief description of the module

The students master the basics of linear algebra and vector calculus. They know the basics of analysis, can confidently deal with functions in several variables and are proficient in differential and integral calculus in several variables. Furthermore, the students are able to apply the basic integral transformations and the corresponding inverse transformations to elementary functions.

Content

Lecture:

- Basics
- Linear algebra
- Differential and integral calculus in several variables
- Integral transformations

Exercises

Exercises accompanying the lectures

Recommended literature

- G. James, P. Dyke: Modern Engineering Mathematics, Pearson, 6th edn. , 2020
- G. James, P. Dyke: Advanced Modern Engineering Mathematics, Pearson, 4th edn. , 2011
- E. Kreyszig,: Advanced Engineering Mathematics, John Wiley & Sons, 10th edn. , 2011

Module name	**Physics 1**		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR24 (IBB 9)	Physics 1	2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Stanzel	Prof. Dr. Stanzel	SU,Pr	5
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Winter Semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	56 h	70 h	24 h

Applicability of the module in the degree programmes

In IBE

Mandatory requirements according to examination regulations

none

Recommended prerequisites

Mathematics and science school education:

- Knowledge of vector calculus (understanding the meaning of scalar and vector product)
- Be able to carry out a curve discussion of simple functions
- Understand the meaning of integration and differentiation of simple functions, be able to perform differentiation and integration of simple functions.
- Understand and calculate exponential and logarithm functions
- Understand and calculate trigonometric functions (sin, cos, tan)
- Be able to solve linear and quadratic equations

Intended learning objectives

After successful participation in the seminar-based teaching, students will be able to …

- Calculate safely with physical quantities and units including prefixes and powers and include them in all calculations.
- Understand and confidently apply the basic kinematic relationships between displacement, velocity and acceleration in translation and circular motion.
- Define the fundamental concept of force and describe the types of force.
- Use Newton's laws confidently and understand them as an important tool in solving problems.
- Understand and distinguish between the concepts of work, energy and power and apply the mechanical law of conservation of energy when solving problems.
- Set up the equation of motion of the one-mass oscillator for the free, damped and forced case and to discuss and interpret the different solution.
- Get to know different forms and realisations of oscillatory systems including damping and excitation mechanisms.
- Understand the phenomenon of resonance in forced oscillation in particular and understand and interpret the meaning of the amplitude resonance curve (amplitude frequency response).
- Name and distinguish thermal state and process variables.
- Calculate changes of state of the ideal gas and reproduce them in p-V diagrams.
- Name the main laws of thermodynamics and apply them to the evaluation and calculation of thermal processes.
- Safely consider heat capacities, phase transformations and heat transport mechanisms in calculations.
- Comprehend the principle of thermal plants based on circular processes.

Furthermore, after successful completion of the internship, students are able to …

- Independently understand the physical relationships in the context of the subject area.
- Perform uncertainty assessments safely.
- Plan experiments and record measurement data as well as evaluate, critically question and scientifically document the results obtained.
- Support each other through teamwork and to have professional discussions.

Brief description of the module

The module consisted of the blocks Size Units Uncertainty Test, Kinematics, Dynamics 1 (Translation), Vibration and Fundamentals of Thermodynamics. Accompanying the lecture, practical experiments are carried out for the subject area of quantities - units - uncertainty - experiment, for the understanding of the kinematic quantities velocity and acceleration as well as for the understanding of mechanical resonance and thermodynamics.

Content
Quantities, units, measurement and evaluation Physical quantities, units, orders of magnitude, significant digits, measurement uncertainties, calculating with uncertainties, compensation line, linearisation **Kinematics** Definition and relationship of displacement, velocity and acceleration as vectorial quantities, special cases: rectilinear and circular motion **Dynamics 1** Concept of force and Newton's axioms, examples of forces, work, energy, power, efficiency, mechanical law of conservation of energy **Oscillations** Setting up the equation of motion of the single-mass oscillator for the free, damped and forced case including discussion and interpretation of the solution, examples of oscillatory systems including damping and excitation mechanisms, resonance, amplitude resonance curve (amplitude frequency response), phase shift (phase frequency response). **Basics of thermodynamics** Thermal state and process variables, heat capacity, ideal gas, main laws of thermodynamics, cyclic processes, phase transformations, heat transport
Recommended literature
• P. A. Tipler, G. Mosca: Physics for Scientists and Engineers, W. H. Freeman, 6. Auflage , 2007

Module name	**Technical Drawing and CAD**		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR25.1 (IBB 12.2 and IBB 19)	TZ-CAD	2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Meierlohr, Prof. Dr. Reuter	Prof. Dr. Meierlohr, Prof. Dr. Reuter	SU,Ü	4
Form of examination	**Module duration**	**Module rotation**	**Language**
see SPO	1 Semester	Winter semester	English
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	54 h	36 h
Applicability of the module in the degree programmes			
The module can be used/compulsory in the International Bachelor of Engineering degree programme. Overall, the students are given an overview of the topics in general mechanical engineering in the course of the lecture. The interaction of different engineering disciplines (e.g. mechanics, machine elements, manufacturing processes, materials technology, assembly technology, quality management, design and product development) is dealt with in particular. The system-technical insight gained creates the interdisciplinary prerequisite for the prospective engineers to understand the product life cycle (interdisciplinary development, production, operation and utilisation) of products and machines holistically.			

Mandatory requirements according to examination regulations

none

Recommended prerequisites

Intended learning objectives

The students are able to specify and document components and assemblies in the form of hand sketches and technical drawings. The students are able to design components and assemblies with the help of a 3D CAD programme and to derive standard-compliant drawings from them. The students can

- transfer spatial facts into the two-dimensional drawing plane
- read and create standardised technical drawings,
- correctly and unambiguously specify basic functional requirements (e.g. fits, surfaces, edges) in technical drawings,
- Generate standardised parts lists,
- create axonometric freehand drawings of components,
- abstract technical sketch

Students learn the efficient use of a modern 3D CAD system and can

- Model sketch-based 3D bodies (turned and milled parts),
- create assemblies from several 3D bodies,
- derive standard-compliant production drawings of individual parts.

Brief description of the module

The course serves to learn the basics of design with a focus on the functionally unambiguous specification and communication of the component design as well as learning a modern 3D CAD system.

Content

Lecture Technical Drawing

- Structure and content of technical drawings
- Construction standards
- Projection drawing
- Representation of individual parts and groups
- Dimensioning, tolerances, fits, edge conditions
- Representation of standard machine elements
- Marking of weld seams Exercise

Technical drawing

- Two-dimensional and axonometric freehand drawing
- Standard-compliant technical drawing and specification
- Mapping of constructive elementary functions (fits, surfaces, edges)
- Specification of functional and production tolerances
- Construction skeletons using concrete product examples

Generation of solids and assemblies, as well as creation of drawings with the aid of a 3D CAD system, in particular:

- Possible uses of CAD programmes, market overview
- Sketching technique, geometric and dimensional conditions
- Functions for creating and removing material
- Model structure
- Module functions
- Drawing derivation

Recommended literature

- Normen DIN et al, Berlin, Beuth Verlag
- Lecture notes for the course
- Online help for the CAD programme
- Video Tutorial, Learning Campus, TH Rosenheim (in German)
- H. Hoischen, A. Fritz, et al.: Technisches Zeichnen, Carl Hanser, 37th Edition, 2020
- R. Gomeringer, et al.: Tabellenbuch Metall, Verlag Europa-Lehrmittel, 48th Edition, 2019
- R. Hanifan: Perfecting Engineering and Technical Drawing : Reducing Errors and Misinterpretations, Springer, 1st Edition, 2014
- S. Tornincasa: Technical Drawing for Product Design : Mastering ISO GPS and ASME GD&T, Springer Nature, 1st Edition, 2020

Module name	Basic Chemistry		
Number(s)	**Abbreviation**	**Curriculum semester**	**ECTS**
IBR25.3 (IBB 13)	Chem.	2	5
Responsible for the module	**Lecturer(s)**	**Teaching form**	**SWS**
Prof. Dr. Larbig	Prof. Dr. Larbig	SU	4
Form of examination	**Module duration**	**Module rotation**	**Language**
schrP	1 Semester	Winter Semester	english
Total workload	**= Presence**	**+ Self-study**	**+ Exam preparation**
150 h	60 h	60 h	30 h
Applicability of the module in the degree programmes			
IBE			
Mandatory requirements according to examination regulations			
none			
Recommended prerequisites			
Intended learning objectives			
The students understand the structure of atoms and the formation of the different types of chemical bonds. The students can apply different atomic and molecular models to practical tasks. Simple redox equations can be created independently. Electrochemical concepts can be applied to galvanic cells and to issues related to corrosion and corrosion protection.			
Brief description of the module			
In this module students receive knowledge of basic concepts in chemistry, including atomic models, theories of chemical bonds, electrochemistry and redox equations.			

Content
Basics of chemistry • Atomic models and the chemical bond • Intermolecular forces • chemical reactions and stoichiometry • Fundamentals of organic chemistry Metals and electrochemistry Redox equations Electrochemical series • galvanic cells • Corrosion and protection against corrosion • Electrochemistry
Recommended literature
• lecture notes