Technische
Hochschule
Georg Agricola

# Appendix 7
# Master's Programme Material Engineering and Industrial Heritage Conservation (MEIHC)

**– non-official version for reading purposes only –**

## University examination regulations of 14 July 2020 for all Master Study Programmes

**in their version of 14 July 2020 (Official announcement 11/2020)**

**in their first amended version of the regulations for the Master Study Programmes at THGA as of 31 August 2021 (Official announcement 10/2021)**

**in the second amended version of the regulations for the Master Study Programmes at THGA as of 15 March 2022 (Official announcement 02/2022)**

**The binding versions are those published in the official announcements of THGA**

A. Regulations specifically applicable to this master's programme
B. Study schedule and examination schedule
C. Module handbook

# Master's Programme Material Engineering and Industrial Heritage Conservation (MEIHC)

## A.1. Regulations specifically applicable to this master's programme

### 1. Qualification aims

The master's programme Material Engineering and Industrial Heritage Conservation (MEIHC) has three focal points. It aims at qualifying the graduates for an engineering profession in material sciences, helping them assess the cultural value of objects, and providing them with cross-disciplinary skills of leadership and organisation.

Moreover, graduates of this consecutive programme will evidence their in-depth specialist knowledge of material sciences acquired during their Bachelor's degree and supplement and enhance that significantly. Moreover, graduates will be able to think across disciplines based on the values they have learned. They will have acquired skills that enable them to discuss matters and closely collaborate with experts of other disciplines in order to develop complex and sustainable (i.e., resource-aware, climate-friendly and environmentally protecting) products and to take on major responsibility even in an international team.

Graduates will be able to define and interpret the particularities, limits, terminology and schools of thought in engineering and partly in humanities as well as issues of industry and organisation.

Moreover, the study programme is such designed that independent investigation of scientific and abstract topics is required; this is reinforced in particular by focal pints of the curriculum implemented as practical courses focusing on research and applications.

Therefore, the knowledge and the comprehension of graduates provide the basics for developing and/or applying own ideas. Graduates will have acquired a large, detailed and critical understanding based on state-of-the-art knowledge. They will be able to develop solutions for problems across disciplines and responsibly deal with technical developments and their dynamics. The master graduates will be able to integrate knowledge and to master complexity as far as expert subjects and societal needs are concerned. They will also be able to make scientifically reasoned decisions even if available information is incomplete or limited considering societal, scientific and ethical concerns which result from the application of their knowledge and from their decisions.

## 2. Availability and admission

(1) The Master's Programme Material Engineering and Industrial Heritage Conservation (MEIHC) continues the university degree programme (either Bachelor or German *Diplom*): Applied Material Sciences or similar. There are two majors offered: Industrial Heritage Conversation and Material Engineering of which one has to be completed.

(2) The following students shall be able to enrol as full-time students or visiting students of the Master's programme MEIHC: students who have been awarded a bachelor degree or a *Diplom* degree in the fields of Applied Material Sciences, Mechanical Engineering, Process Engineering or similar.

(3) The following students shall also be able to enrol as students of the Master's programme Material Engineering and Industrial Heritage Conservation: students who have been awarded a Bachelor's degree or a *Diplom* degree in other fields of engineering and science within scope of the jurisdiction of the German Constitution provided the specialist preconditions for a successful completion of the Master's programme Material Engineering and Industrial Heritage Conservation are given, and the study objectives as stipulated in section 2(2) of the relevant examination regulations can be achieved. The same applies to students who have obtained university degrees of science and engineering outside the scope of the jurisdiction of the German Constitution provided the degrees meet the requirements of paragraph 1 and contain a final thesis.

(4) Another prerequisite to commence the studies is a qualified degree with a result of the overall mark 2.0 (good, ECTS mark B) or higher awarded in a university degree programme (either Bachelor or German *Diplom*).

(5) If the student does not the requirements stated in paragraph 2 or assigned to paragraphs 3 or 4, he or she may be permitted to enrol in the programme in individual cases. After checking the documents, is there is a case of doubt, an admission interview or a written test will determine whether the candidate is eligible to commence his or her studies. This eligibility will be determined by an admission committee according to no. 3 of this appendix. Based on the admission interview or a written report, the admission committee shall decide whether the specialist qualification in the basic subjects of Applied Material Sciences can be evidenced by the candidate.

(6) The courses of the study programme will be offered in English only.

Therefore, another criterion of admission is the evidence of English language knowledge at a level of minimum B2 according to the Common European Framework of Reference. To evidence this knowledge, one of the following qualifications must be provided:

(a) having passed the TOEFL iBT with a result of 87 points minimum
(b) having passed the IELTS test with a result of 6.0 points
(c) having passed another acknowledged language test with a result equivalent to TOEFL and IETLS points
(d) having completed a study programme fully in English at an acknowledged university of a duration of at least one year
(e) having completed school education fully in English at an acknowledged school of a duration of at least one year
(f) having obtained a degree in a relevant study programme that offers courses of technical English with a scope of at least 2 credit points (CP).

(g) speaking English as a native language or having grown up and completed school education in an English-speaking country.

If students have obtained their Bachelor's degree at THGA, their language knowledge is deemed as evidenced.

### 3. Admission and selection committee and selection guidelines

(1) The responsible department is to establish an admission committee for the Master's programme MEIHC to arrange the duties entrusted to it by section 2 and section 3 of this appendix.

(2) The committee shall constitute of not fewer than two, and not more than three persons entitled to vote; at least two of them have to be selected from the group of professors teaching the Bachelor's programme Applied Material Sciences or the Master's programme MEIHC. The head of the Master's programme MEIHC is automatically a member of the committee. Each public servant of the department or other members of the university can be appointed as voting members of the admission committee, provided they have the necessary personal and specialised eligibility. Other members of the THGA and executives of companies can be appointed as non-voting members of the admission committee.

(3) The members of this committee and its chairperson are proposed by the head of the Master's programme and appointed by the examination board.

(4) The admission committee constitutes a quorum if more than half of its voting members are present and if the meeting has been called in with a written invitation sent out at least five working days prior to the date of the meeting. Important documents relevant for any resolution have to be enclosed with or attached to the invitation. Resolutions shall be passed with the majority of the votes cast of the voting members being present. The admission committee shall decide on the appointment of establishing the eligibility of candidates; the candidates shall be invited to the appointment of establishing their eligibility by the admission committee at least five working days prior to the date of establishing the eligibility. The invitation is sent in written form, if needed, by email.

(5) The eligibility of candidates is assessed by examining them on specialist knowledge in the fields of material engineering, mechanics, metallurgy, thermos-dynamics, corrosion, tribology and damage analysis.

(6) After the admission committee has finished the assessment of the admission criteria it will decide on the candidates' admission to the study programme.

(7) Decisions of the admission committee have to be recorded in writing.

## 4. Module descriptions

Die Modulbeschreibungen im Modulhandbuch (Anlage 8) geben Aufschluss über

- die Zuordnung der einzelnen Lehrveranstaltungen zum Studienverlaufsplan,
- den Umfang der einzelnen Lehrveranstaltungen,
- die Ziele (Lernergebnisse) der einzelnen Lehrveranstaltungen,
- die inhaltliche Beschreibung der Prüfungsgebiete.

(1) The programme consists of compulsory modules for both disciplines, optional compulsory modules for each discipline, and a work placement of a total number of 40 working days as stipulated in the Guidelines for the Work Placement (Appendix 2).

(2) The study programme contains face-to-face modules (lectures, seminars, exercises etc.) of a scope of 60 CP, and research-focused self-study courses of a scope of 60 CP; the latter ones include the Master's thesis. The face-to-face modules are self-contained, independent modules of the same size (5 CP each) so that the students can easily and flexibly compile their semester programme from the modules offered in the winter and summer semester. The research-related modules can be freely chosen disregarding the semester.

## 5. Compulsory optional modules

(1) During their studies, students have to take four compulsory optional modules. It is recommended to select one module from the list provided in the curriculum (section B).

(2) One or several modules or sub-modules can be selected as a compulsory optional module from the compulsory optional modules listed in the curriculum, provided they are credited with at least 5 credit points.

(3) On behalf of the students, the vice president can decide that additional compulsory optional modules will be offered.

## 6. Master's thesis

(1) Candidates can only be admitted to the Master's thesis once they have achieved at least 70 credit points.

(2) Students have four months (full-time) or up to six months (part-time) to write their Master's thesis; the thesis must have a workload of 20 CP.

## 7. Final oral examination (colloquium)

(3) The final oral examination (*colloquium*) supplements the Master's thesis, will be graded independently and is to be completed within two months after the Master's thesis has been submitted. The final oral examination has a workload of 5 CP.

## B. Curricula and examination schedules

as of: 15.03.2022

**Curriculum**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (part-time) Major: Industrial Heritage Conservation

**Compulsory modules** Programme enrolment: Winter semester

| Module number | Exam number | Module for the study programme | Weekly lessons per semester | | | | | | | CP | Exam precon-dition | Exam event | Exam type | CP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | ST | E | S | PE | FM | ∑ | | | | | WS 1. | SS 2. | WS 3. | SS 4. | WS 5. | SS 6. |
| | | **Management Skills** | | | | | | | | **10** | | | | | | | | | |
| **MEIHC 01** | 40265130 | Health and Safety, Environmental Aspects 2 | 1 | | 2 | | | | 3 | 5 | | ME 1 | W/O | 5 | | | | | |
| **MEIHC 02** | 40035100 | Project and Risk Management | | 2 | 1 | | | | 3 | 5 | | ME 2 | W/O/SP | | 5 | | | | |
| | | **Trans-disciplinary modules** | | | | | | | | **25** | | | | | | | | | |
| **MEIHC 03** | 40035110 | Cultural History and Sustainable Theory | | 2 | 1 | | | | 3 | 5 | | ME 3 | W/O/SP | 5 | | | | | |
| **MEIHC 04** | 40035120 | Aging - Simulation and Practice | | 2 | 1 | | | | 3 | 5 | | ME 4 | W/O/SP | 5 | | | | | |
| **MEIHC 05** | 40035130 | Consolidation in Practice: Damage Analysis | | 2 | 1 | | | | 3 | 5 | | ME 5 | W/O/SP | | 5 | | | | |
| **MEIHC 06** | 40035140 | Heritage Conservation and Conservation Ethics | | 3 | | | | | 3 | 5 | | ME 6 | W/O/SP | | 5 | | | | |
| **MEIHC 07** | 40035150 | Building Materials in Construction and Architecture | | 2 | 1 | | | | 3 | 5 | | ME 7 | W/O/SP | | | | 5 | | |
| | | **Major: Industrial Heritage Conservation** | | | | | | | | **40** | | | | | | | | | |
| **MEIHC 08b** | 51035100 | Industrial Heritage | | 3 | | | | | 3 | 5 | | ME 8 | W/O/SP | 5 | | | | | |
| **MEIHC 09b** | 51035110 | Building Archaeology and Constructive Conservation | | 2 | 1 | | | | 3 | 5 | | ME 9 | W/O/SP | | | | | 5 | |
| **MEIHC 10b** | 51035120 | Material Cultural History | | 3 | | | | | 3 | 5 | | ME 10 | W/O/SP | | | | | | 5 |
| **MEIHC 11b** | 51035130 | Theory of the Object / Object and Material | | 2 | 1 | | | | 3 | 5 | | ME 11 | W/O/SP | | 5 | | | | |
| **MEIHC 12b** | | Compulsory optional module 1 | | | | | | | | 5 | | ME 12 | cf. COP | | | 5 | | | |
| **MEIHC 13b** | | Compulsory optional module 2 | | | | | | | | 5 | | ME 13 | cf. COP | | | | | 5 | |
| **MEIHC 14b** | | Compulsory optional module 3 | | | | | | | | 5 | | ME 14 | cf. COP | | | | 5 | | |
| **MEIHC 15b** | | Compulsory optional module 4 | | | | | | | | 5 | | ME 15 | cf. COP | | | | 5 | | |
| | | **Research-oriented modules** | | | | | | | | **20** | | | | | | | | | |
| **MEIHC 16** | 40061230 | Communication and Presentation Skills for Industry and Business | | | | 3 | | | 3 | 5 | | ME 16 | SP | | | 5 | | | |
| **MEIHC 17** | 40035160 | Practice Course: The example Zollverein I | 1 | | | | 3 | | 4 | 5 | CA PE | ME 17 | W/O/SP | | 5 | | | | |
| **MEIHC 18** | 40035170 | Practice Course: The example Zollverein II | | | | | 6 | | 6 | 10 | CA PE | ME 18 | W/O/SP | | | 10 | | | |
| **MEIHC 19** | | **Master's thesis und Final oral examination** | | | | | | | | | | | | | | | | | |
| | | Master's thesis | | | | | | | 0 | 20 | PC [1] | PME 19.1 | SP | | | | 10 | 10 | |
| | | Final oral examination | | | | | | | 0 | 5 | PC [2] | PME 19.2 | O | | | | | | 5 |
| | | **Total study time (without major subjects/compulsory optional modules)** | 2 | 23 | 9 | 3 | 9 | 0 | 46 | **120** | | | | 20 | 20 | 20 | 20 | 20 | 20 |
| | | **Total study time per year** | | | | | | | | | | | | 40 | | 40 | | 40 | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

L = Lecture; ST = Seminaristic Teaching; E = Exercise, S = Seminar, PE = Practical Exercise; W = Written exam, O = Oral exam; SP = Seminar Paper; ME = Module Exam; PME =Partial Module Exam; PC = Pre-Condition; CA = Certificate of Attendance,

**Recommended compulsory optional modules**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MEIHC 12-15** | | **Compulsory optional module** | | | | | | | | | | | | | | | | | |
| **MEIHC 12-15b.1** | 40061160 | Structural Durability | 1 | | 1 | | 1 | | 3 | 5 | TN P | ME 12-15.1 | W/O/SP | | | | 5 | | |
| | *PVL40061160* | *PC Structural Durability* | | | | | | | | | | | | | | | | | |
| **MEIHC 12-15b.2** | 40061130 | Advanced Strength of Materials | 2 | | 1 | | | | 3 | 5 | | ME 12-15.2 | W/O | | | 5 | | | |
| **MEIHC 12-15b.3** | 60035100 | Additive Manufacturing | | 2 | 1 | | | | 3 | 5 | | ME 12-15.3 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15b.4** | 40061200 | Manufacturing Technologies | 2 | | 1 | | | | 3 | 5 | | ME 12-15.4 | W/O | | 5 | | | | |
| **MEIHC 12-15b.5** | 60061110 | Machining Technologies | | | | 3 | | | 3 | 5 | | ME 12-15.5 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15b.6** | 40061110 | Product Safety | 2 | | 1 | | | | 3 | 5 | | ME 12-15.6 | W/O | | | 5 | | | |
| **MEIHC 12-15b.7** | | Controlling, Leadership and Corporate Governance | 2 | 1 | | | | | 3 | | | ME 12-15.7 | W/O | | | 5 | | | |
| **MEIHC 12-15b.8** | | Sustainable Energy and Raw Materials Supply | | 2 | 1 | | | | 3 | 5 | | ME 12-15.8 | W/O | | | 5 | | | |
| **MEIHC 12-15b.9** | | Law and Administrative Practice | | 2 | 1 | | | | 3 | 5 | | ME 12-15.9 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15b.10** | | Metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 12-15.10 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15b.11** | | Powder Metallurgy | | 2 | 1 | | | | 3 | 5 | | ME 12-15.11 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15b.12** | | Non-metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 12-15.12 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15b.13** | | Surface Technologies | | 2 | 1 | | | | 3 | 5 | | ME 12-15.13 | W/O/SP | | | | 5 | | |

as of: 15.03.2022

**Curriculum**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (full-time) Major: Industrial Heritage Conservation

**Compulsory modules** Programme enrolment: Winter semester

| Module number | Exam number | Module for the study programme | Weekly lessons per semester | | | | | | | CP | Exam precon-dition | Exam event | Exam type | CP | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | ST | E | S | PE | FM | ∑ | | | | | WS 1. | SS 2. | WS 3. | SS 4. |
| | | **Management Skills** | | | | | | | | **10** | | | | | | | |
| **MEIHC 01** | 40265130 | Health and Safety, Environmental Aspects 2 | 1 | | 2 | | | | 3 | 5 | | ME 1 | W/O | 5 | | | |
| **MEIHC 02** | 40035100 | Project and Risk Management | | 2 | 1 | | | | 3 | 5 | | ME 2 | W/O/SP | 5 | | | |
| | | **Trans-disciplinary modules** | | | | | | | | **25** | | | | | | | |
| **MEIHC 03** | 40035110 | Cultural History and Sustainable Theory | | 2 | 1 | | | | 3 | 5 | | ME 3 | W/O/SP | 5 | | | |
| **MEIHC 04** | 40035120 | Aging - Simulation and Practice | | 2 | 1 | | | | 3 | 5 | | ME 4 | W/O/SP | 5 | | | |
| **MEIHC 05** | 40035130 | Consolidation in Practice: Damage Analysis | | 2 | 1 | | | | 3 | 5 | | ME 5 | W/O/SP | | 5 | | |
| **MEIHC 06** | 40035140 | Heritage Conservation and Conservation Ethics | | 3 | | | | | 3 | 5 | | ME 6 | W/O/SP | | 5 | | |
| **MEIHC 07** | 40035150 | Building Materials in Construction and Architecture | | 2 | 1 | | | | 3 | 5 | | ME 7 | W/O/SP | | 5 | | |
| | | **Major: Industrial Heritage Conservation** | | | | | | | | **40** | | | | | | | |
| **MEIHC 08b** | 51035100 | Industrial Heritage | | 3 | | | | | 3 | 5 | | ME 8 | W/O/SP | 5 | | | |
| **MEIHC 09b** | 51035110 | Building Archaeology and Constructive Conservation | | 2 | 1 | | | | 3 | 5 | | ME 9 | W/O/SP | | | 5 | |
| **MEIHC 10b** | 51035120 | Material Cultural History | | 3 | | | | | 3 | 5 | | ME 10 | W/O/SP | | 5 | | |
| **MEIHC 11b** | 51035130 | Theory of the Object / Object and Material | | 2 | 1 | | | | 3 | 5 | | ME 11 | W/O/SP | | 5 | | |
| **MEIHC 12b** | | Compulsory optional module 1 | | | | | | | | 5 | | ME 12 | s. COP | | | 5 | |
| **MEIHC 13b** | | Compulsory optional module 2 | | | | | | | | 5 | | ME 13 | s. COP | | | 5 | |
| **MEIHC 14b** | | Compulsory optional module 3 | | | | | | | | 5 | | ME 14 | s. COP | | | 5 | |
| **MEIHC 15b** | | Compulsory optional module 4 | | | | | | | | 5 | | ME 15 | s. COP | | | | 5 |
| | | **Research-oriented modules** | | | | | | | | **20** | | | | | | | |
| **MEIHC 16** | 40061230 | Communication and Presentation Skills for Industry and Business | | | | 3 | | | 3 | 5 | | ME 16 | SP | 5 | | | |
| | *40061230 S* | *Communication and Presentation Skills for Industry and Business / Seminar* | | | | | | | | | | | | | | | |
| **MEIHC 17** | 40035160 | Practice Course: The example Zollverein I | 1 | | | | 3 | | 4 | 5 | CA PE | ME 17 | W/O/SP | | 5 | | |
| | *40035160 L* | *Practice Course: The example Zollverein I lecture* | | | | | | | | | | | | | | | |
| | *40035160 PE* | *Practice Course: The example Zollverein I practical exercise* | | | | | | | | | | | | | | | |
| **MEIHC 18** | 40035170 | Practice Course: The example Zollverein II | | | | | 6 | | 6 | 10 | CA PE | ME 18 | W/O/SP | | | 10 | |
| | 40035170 PE | Practice Course: The example Zollverein II practical exercise | | | | | | | | | | | | | | | |
| **MEIHC 19** | | **Master's thesis und Final oral examination** | | | | | | | | | | | | | | | |
| | | Master's thesis | | | | | | | 0 | 20 | PC [1] | PME 19.1 | SP | | | | 20 |
| | | Final oral examination | | | | | | | 0 | 5 | PC [2] | PME 19.2 | O | | | | 5 |
| | | **Total study time (without major subjects/compulsory optional modules)** | 2 | 23 | 9 | 3 | 9 | 0 | 46 | **120** | | | | 30 | 30 | 30 | 30 |
| | | **Total study time per year** | | | | | | | | | | | | 60 | | 60 | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

L = Lecture; ST = Seminaristic Teaching; E = Exercise, S = Seminar, PE = Practical Exercise; W = Written exam, O = Oral exam; SP = Seminar Paper; ME = Module Exam; PME =Partial Module Exam; PC = Pre-Condition; CA = Certificate of Attendance

**Recommended compulsory optional modules**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MEIHC 12-15** | | **Compulsory optional module** | | | | | | | | | | | | | | | |
| **MEIHC 12-15b.1** | 40061160 | Structural Durability | 1 | | 1 | | 1 | | 3 | 5 | TN P | ME 12-15.1 | W/O/SP | | 5 | | |
| | *PVL40061160* | *PC Structural Durability* | | | | | | | | | | | | | | | |
| **MEIHC 12-15b.2** | 40061130 | Advanced Strength of Materials | 2 | | 1 | | | | 3 | 5 | | ME 12-15.2 | W/O | | | 5 | |
| **MEIHC 12-15b.3** | 60035100 | Additive Manufacturing | | 2 | 1 | | | | 3 | 5 | | ME 12-15.3 | W/O/SP | | 5 | | |
| **MEIHC 12-15b.4** | 40061200 | Manufacturing Technologies | 2 | | 1 | | | | 3 | 5 | | ME 12-15.4 | W/O | | 5 | | |
| **MEIHC 12-15b.5** | 60061110 | Machining Technologies | | | | 3 | | | 3 | 5 | | ME 12-15.5 | W/O/SP | | | | 5 |
| **MEIHC 12-15b.6** | 40061110 | Product Safety | 2 | | 1 | | | | 3 | 5 | | ME 12-15.6 | W/O | | | 5 | |
| **MEIHC 12-15b.7** | | Controlling, Leadership and Corporate Governance | 2 | 1 | | | | | 3 | | | ME 12-15.7 | W/O | | | 5 | |
| **MEIHC 12-15b.8** | | Sustainable Energy and Raw Materials Supply | | 2 | 1 | | | | 3 | 5 | | ME 12-15.8 | W/O | | | 5 | |
| **MEIHC 12-15b.9** | | Law and Administrative Practice | | 2 | 1 | | | | 3 | 5 | | ME 12-15.9 | W/O/SP | | | 5 | |
| **MEIHC 12-15b.10** | | Metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 12-15.10 | W/O/SP | | | 5 | |
| **MEIHC 12-15b.11** | | Powder Metallurgy | | 2 | 1 | | | | 3 | 5 | | ME 12-15.11 | W/O/SP | | | 5 | |
| **MEIHC 12-15b.12** | | Non-metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 12-15.12 | W/O/SP | | 5 | | |
| **MEIHC 12-15b.13** | | Surface Technologies | | 2 | 1 | | | | 3 | 5 | | ME 12-15.13 | W/O/SP | | | | 5 |

as of: 15.03.2022

**Curriculum**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (part-time) Major: Material Engineering

**Compulsory modules** Programme enrolment: Winter semester

| Module number | Exam number | Module for the study programme | Weekly lessons per semester | | | | | | | CP | Exam precondition | Exam event | Exam type | CP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | ST | E | S | PE | FM | Σ | | | | | WS 1. | SS 2. | WS 3. | SS 4. | WS 5. | SS 6. |
| | | **Management Skills** | | | | | | | | **10** | | | | | | | | | |
| **MEIHC 01** | 40265130 | Health and Safety, Environmental Aspects 2 | 1 | | 2 | | | | 3 | 5 | | ME 1 | W/O | 5 | | | | | |
| **MEIHC 02** | 40035100 | Project and Risk Management | | 2 | 1 | | | | 3 | 5 | | ME 2 | W/O/SP | | | 5 | | | |
| | | **Trans-disciplinary modules** | | | | | | | | **25** | | | | | | | | | |
| **MEIHC 03** | 40035110 | Cultural History and Sustainable Theory | | 2 | 1 | | | | 3 | 5 | | ME 3 | W/O/SP | 5 | | | | | |
| **MEIHC 04** | 40035120 | Aging - Simulation and Practice | | 2 | 1 | | | | 3 | 5 | | ME 4 | W/O/SP | 5 | | | | | |
| **MEIHC 05** | 40035130 | Consolidation in Practice: Damage Analysis | | 2 | 1 | | | | 3 | 5 | | ME 5 | W/O/SP | | 5 | | | | |
| **MEIHC 06** | 40035140 | Heritage Conservation and Conservation Ethics | | 3 | | | | | 3 | 5 | | ME 6 | K/M/A | | 5 | | | | |
| **MEIHC 07** | 40035150 | Building Materials in Construction and Architecture | | 2 | 1 | | | | 3 | 5 | | ME 7 | W/O/SP | | | | 5 | | |
| | | **Major: Material Engineering** | | | | | | | | **40** | | | | | | | | | |
| **MEIHC 08a** | 50035100 | Metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 8 | W/O/SP | 5 | | | | | |
| **MEIHC 09a** | 50035110 | Powder Metallurgy | | 2 | 1 | | | | 3 | 5 | | ME 9 | W/O/SP | | | | | 5 | |
| **MEIHC 10a** | 50035120 | Non-metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 10 | W/O/SP | | | | 5 | | |
| **MEIHC 11a** | 50035130 | Surface Technologies | | 2 | 1 | | | | 3 | 5 | | ME 11 | W/O/SP | | | | 5 | | |
| **MEIHC 12a** | | Compulsory optional module 1 | | | | | | | | 5 | | ME 12 | s. COP | | 5 | | | | |
| **MEIHC 13a** | | Compulsory optional module 2 | | | | | | | | 5 | | ME 13 | s. COP | | | | | 5 | |
| **MEIHC 14a** | | Compulsory optional module 3 | | | | | | | | 5 | | ME 14 | s. COP | | | | 5 | | |
| **MEIHC 15a** | | Compulsory optional module 4 | | | | | | | | 5 | | ME 15 | s. COP | | | | | | 5 |
| | | **Research-oriented modules** | | | | | | | | **20** | | | | | | | | | |
| **MEIHC 16** | 40061230 | Communication and Presentation Skills for Industry and Business | | | | 3 | | | 3 | 5 | | ME 16 | A | | | 5 | | | |
| **MEIHC 17** | 40035160 | Practice Course: The example Zollverein I | 1 | | | | 3 | | 4 | 5 | CA PE | ME 17 | W/O/SP | | 5 | | | | |
| **MEIHC 18** | 40035170 | Practice Course: The example Zollverein II | | | | | 6 | | 6 | 10 | CA PE | ME 18 | W/O/SP | | | 10 | | | |
| **MEIHC 19** | | **Master's thesis und Final oral examination** | | | | | | | | | | | | | | | | | |
| | | Master's thesis | | | | | | | 0 | 20 | PC [1] | PME 19.1 | A | | | | | 10 | 10 |
| | | Final oral examination | | | | | | | 0 | 5 | PVL [2] | PME 19.2 | M | | | | | | 5 |
| | | **Total study time (without major subjects/compulsory optional modules)** | 2 | 21 | 11 | 3 | 9 | 0 | 46 | **120** | | | | 20 | 20 | 20 | 20 | 20 | 20 |
| | | **Total study time per year** | | | | | | | | | | | | 40 | | 40 | | 40 | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

L = Lecture; ST = Seminaristic Teaching; E = Exercise, S = Seminar, PE = Practical Exercise; W = Written exam, O = Oral exam; SP = Seminar Paper; ME = Module Exam; PME =Partial Module Exam; PC = Pre-Condition; CA = Certificate of Attendance

**Recommended compulsory optional modules**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MEIHC 12-15** | | **Compulsory optional module** | | | | | | | | | | | | | | | | | |
| **MEIHC 12-15a.1** | 40061160 | Structural Durability | 1 | | 1 | | 1 | | 3 | 5 | CA PE | ME 12-15.1 | W/O/SP | | | | 5 | | |
| | *PVL40061160* | *PC Structural Durability* | | | | | | | | | | | | | | | | | |
| **MEIHC 12-15a.2** | 40061130 | Advanced Strength of Materials | 2 | | 1 | | | | 3 | 5 | | ME 12-15.2 | W/O | | | 5 | | | |
| **MEIHC 12-15a.3** | 60035100 | Additive Manufacturing | | 2 | 1 | | | | 3 | 5 | | ME 12-15.3 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15a.4** | 40061200 | Manufacturing Technologies | 2 | | 1 | | | | 3 | 5 | | ME 12-15.4 | W/O | | 5 | | | | |
| **MEIHC 12-15a.5** | 60061110 | Machining Technologies | | | | 3 | | | 3 | 5 | | ME 12-15.5 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15a.6** | 40061110 | Product Safety | 2 | | 1 | | | | 3 | 5 | | ME 12-15.6 | W/O | | | 5 | | | |
| **MEIHC 12-15a.7** | | Controlling, Leadership and Corporate Governance | 2 | 1 | | | | | 3 | | | ME 12-15.7 | W/O | | | 5 | | | |
| **MEIHC 12-15a.8** | | Sustainable Energy and Raw Materials Supply | | 2 | 1 | | | | 3 | 5 | | ME 12-15.8 | W/O | | | 5 | | | |
| **MEIHC 12-15a.9** | | Law and Administrative Practice | | 2 | 1 | | | | 3 | 5 | | ME 12-15.9 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15a.10** | | Industrial Heritage | | 3 | | | | | 3 | 5 | | ME 12-15.10 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15a.11** | | Building Archaeology and Constructive Conservation | | 2 | 1 | | | | 3 | 5 | | ME 12-15.11 | W/O/SP | | | 5 | | | |
| **MEIHC 12-15a.12** | | Material Cultural History | | 3 | | | | | 3 | 5 | | ME 12-15.12 | W/O/SP | | | | 5 | | |
| **MEIHC 12-15a.13** | | Theory of the Object / Object and Material | | 2 | 1 | | | | 3 | 5 | | ME 12-15.13 | W/O/SP | | 5 | | | | |

as of: 15.03.2022

**Curriculum**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (full-time) Major: Material Engineering

**Compulsory modules** Programme enrolment: Winter semester

| Module number | Exam number | Module for the study programme | Weekly lessons per semester | | | | | | | CP | Exam pre-con-dition | Exam event | Exam type | CP | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | ST | E | S | PE | FM | Σ | | | | | WS 1. | SS 2. | WS 3. | SS 4. |
| | | **Management Skills** | | | | | | | | **10** | | | | | | | |
| **MEIHC 01** | 40265130 | Health and Safety, Environmental Aspects 2 | 1 | | 2 | | | | 3 | 5 | | ME 1 | W/O | 5 | | | |
| **MEIHC 02** | 40035100 | Project and Risk Management | | 2 | 1 | | | | 3 | 5 | | ME 2 | W/O/SP | 5 | | | |
| | | **Trans-disciplinary modules** | | | | | | | | **25** | | | | | | | |
| **MEIHC 03** | 40035110 | Cultural History and Sustainable Theory | | 2 | 1 | | | | 3 | 5 | | ME 3 | W/O/SP | 5 | | | |
| **MEIHC 04** | 40035120 | Aging - Simulation and Practice | | 2 | 1 | | | | 3 | 5 | | ME 4 | W/O/SP | 5 | | | |
| **MEIHC 05** | 40035130 | Consolidation in Practice: Damage Analysis | | 2 | 1 | | | | 3 | 5 | | ME 5 | W/O/SP | | 5 | | |
| **MEIHC 06** | 40035140 | Heritage Conservation and Conservation Ethics | | 3 | | | | | 3 | 5 | | ME 6 | K/M/A | | 5 | | |
| **MEIHC 07** | 40035150 | Building Materials in Construction and Architecture | | 2 | 1 | | | | 3 | 5 | | ME 7 | W/O/SP | | 5 | | |
| | | **Major: Material Engineering** | | | | | | | | **40** | | | | | | | |
| **MEIHC 08a** | 50035100 | Metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 8 | W/O/SP | 5 | | | |
| **MEIHC 09a** | 50035110 | Powder Metallurgy | | 2 | 1 | | | | 3 | 5 | | ME 9 | W/O/SP | | | 5 | |
| **MEIHC 10a** | 50035120 | Non-metal Corrosion and Tribology | | 2 | 1 | | | | 3 | 5 | | ME 10 | W/O/SP | | 5 | | |
| **MEIHC 11a** | 50035130 | Surface Technologies | | 2 | 1 | | | | 3 | 5 | | ME 11 | W/O/SP | | 5 | | |
| **MEIHC 12a** | | Compulsory optional module 1 | | | | | | | | 5 | | ME 12 | cf. COP | | | 5 | |
| **MEIHC 13a** | | Compulsory optional module 2 | | | | | | | | 5 | | ME 13 | cf. COP | | | 5 | |
| **MEIHC 14a** | | Compulsory optional module 3 | | | | | | | | 5 | | ME 14 | cf. COP | | | 5 | |
| **MEIHC 15a** | | Compulsory optional module 4 | | | | | | | | 5 | | ME 15 | cf. COP | | | | 5 |
| | | **Research-oriented modules** | | | | | | | | **20** | | | | | | | |
| **MEIHC 16** | 40061230 | Communication and Presentation Skills for Industry and Business | | | | 3 | | | 3 | 5 | | ME 16 | A | 5 | | | |
| **MEIHC 17** | 40035160 | Practice Course: The example Zollverein I | 1 | | | | 3 | | 4 | 5 | CA PE | ME 17 | W/O/SP | | 5 | | |
| **MEIHC 18** | 40035170 | Practice Course: The example Zollverein II | | | | | 6 | | 6 | 10 | CA PE | ME 18 | W/O/SP | | | 10 | |
| **MEIHC 19** | | **Master's thesis und Final oral examination** | | | | | | | | | | | | | | | |
| | | Master's thesis | | | | | | | 0 | 20 | PC [1] | PME 19.1 | A | | | | 20 |
| | | Final oral examination | | | | | | | 0 | 5 | PVL [2] | PME 19.2 | M | | | | 5 |
| | | **Total study time (without major subjects/Compulsory optional modules)** | 2 | 21 | 11 | 3 | 9 | 0 | 46 | **120** | | | | 30 | 30 | 30 | 30 |
| | | **Total study time per year** | | | | | | | | | | | | 60 | | 60 | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

L = Lecture; ST = Seminaristic Teaching; E = Exercise, S = Seminar, PE = Practical Exercise; W = Written exam, O = Oral exam; SP = Seminar Paper; ME = Module Exam; PME =Partial Module Exam; PC = Pre-Condition; CA = Certificate of Attendance

**Recommended compulsory optional modules**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MEIHC 12-15** | | **Compulsory optional module** | | | | | | | | | | | | | | | |
| **MEIHC 12-15a.1** | 40061160 | Structural Durability | 1 | | 1 | | 1 | | 3 | 5 | CA PE | ME 12-15.1 | W/O/SP | | | | 5 |
| | *PVL40061160* | *PC Structural Durability* | | | | | | | | | | | | | | | |
| **MEIHC 12-15a.2** | 40061130 | Advanced Strength of Materials | 2 | | 1 | | | | 3 | 5 | | ME 12-15.2 | W/O | | | 5 | |
| **MEIHC 12-15a.3** | 60035100 | Additive Manufacturing | | 2 | 1 | | | | 3 | 5 | | ME 12-15.3 | W/O/SP | | | | 5 |
| **MEIHC 12-15a.4** | 40061200 | Manufacturing Technologies | 2 | | 1 | | | | 3 | 5 | | ME 12-15.4 | W/O | | 5 | | |
| **MEIHC 12-15a.5** | 60061110 | Machining Technologies | | | | 3 | | | 3 | 5 | | ME 12-15.5 | W/O/SP | | | | 5 |
| **MEIHC 12-15a.6** | 40061110 | Product Safety | 2 | | 1 | | | | 3 | 5 | | ME 12-15.6 | W/O | | | 5 | |
| **MEIHC 12-15a.7** | | Controlling, Leadership and Corporate Governance | 2 | 1 | | | | | 3 | | | ME 12-15.7 | W/O | | | 5 | |
| **MEIHC 12-15a.8** | | Sustainable Energy and Raw Materials Supply | | 2 | 1 | | | | 3 | 5 | | ME 12-15.8 | W/O | | | 5 | |
| **MEIHC 12-15a.9** | | Law and Administrative Practice | | 2 | 1 | | | | 3 | 5 | | ME 12-15.9 | W/O/SP | | | 5 | |
| **MEIHC 12-15a.10** | | Industrial Heritage | | 3 | | | | | 3 | 5 | | ME 12-15.10 | W/O/SP | | | 5 | |
| **MEIHC 12-15a.11** | | Building Archaeology and Constructive Conservation | | 2 | 1 | | | | 3 | 5 | | ME 12-15.11 | W/O/SP | | | 5 | |
| **MEIHC 12-15a.12** | | Material Cultural History | | 3 | | | | | 3 | 5 | | ME 12-15.12 | W/O/SP | | | | 5 |
| **MEIHC 12-15a.13** | | Theory of the Object / Object and Material | | 2 | 1 | | | | 3 | 5 | | ME 12-15.13 | W/O/SP | | 5 | | |

**Examination schedule**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (part-time) Major: Industrial Heritage Conservation

**Compulsory modules** Programme enrolment: Winter semester

| Exam number | Module for the study programme | CP | Exam prec. | Exam event | Exam type | Semester |
|---|---|---|---|---|---|---|
| | **Management Skills** | **10** | | | | |
| 40265130 | Health and Safety, Environmental Aspects 2 | 5 | | ME 1 | W/O | 1 |
| 40035100 | Project and Risk Management | 5 | | ME 2 | W/O/SP | 3 |
| | **Trans-disciplinary modules** | **25** | | | | |
| 40035110 | Cultural History and Sustainable Theory | 5 | | ME 3 | W/O/SP | 1 |
| 40035120 | Aging - Simulation and Practice | 5 | | ME 4 | W/O/SP | 1 |
| 40035130 | Consolidation in Practice: Damage Analysis | 5 | | ME 5 | W/O/SP | 2 |
| 40035140 | Heritage Conservation and Conservation Ethics | 5 | | ME 6 | W/O/SP | 2 |
| 40035150 | Building Materials in Construction and Architecture | 5 | | ME 7 | W/O/SP | 4 |
| | **Major: Industrial Heritage Conservation** | **40** | | | | |
| 51035100 | Industrial Heritage | 5 | | ME 8 | W/O/SP | 1 |
| 51035110 | Building Archaeology and Constructive Conservation | 5 | | ME 9 | W/O/SP | 5 |
| 51035120 | Material Cultural History | 5 | | ME 10 | W/O/SP | 6 |
| 51035130 | Theory of the Object / Object and Material | 5 | | ME 11 | W/O/SP | 2 |
| | Compulsory optional module 1 | 5 | | ME 12 | cf. COP | 4 |
| | Compulsory optional module 2 | 5 | | ME 13 | cf. COP | 5 |
| | Compulsory optional module 3 | 5 | | ME 14 | cf. COP | 4 |
| | Compulsory optional module 4 | 5 | | ME 15 | cf. COP | 4 |
| | **Research-oriented modules** | **20** | | | | |
| 40061230 | Communication and Presentation Skills for Industry and Business | 5 | | ME 16 | SP | 3 |
| 40035160 | Practice Course: The example Zollverein I | 5 | CA P | ME 17 | W/O/SP | 2 |
| 40035170 | Practice Course: The example Zollverein II | 10 | CA P | ME 18 | W/O/SP | 3 |
| | **Master's thesis und Final oral examination** | | | | | |
| | Master's thesis | 20 | PC [1] | PME 19.1 | SP | 5, 6 |
| | Final oral examination | 5 | PC [2] | PME 19.2 | O | 6 |
| | **Total study time (without major subjects/compulsory optional modules)** | **120** | | | | |
| | **Total study time per year** | | | | | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

**Recommended compulsory optional modules**

| | **Compulsory optional module** | | | | | |
|---|---|---|---|---|---|---|
| 40061160 | Structural Durability | 5 | CA P | ME 12-15.1 | W/O/SP | 4 |
| *PC40061160* | *PC Structural Durability* | | | | | |
| 40061130 | Advanced Strength of Materials | 5 | | ME 12-15.2 | W/O | 3 |
| 60035100 | Additive Manufacturing | 5 | | ME 12-15.3 | W/O/SP | 4 |
| 40061200 | Manufacturing Technologies | 5 | | ME 12-15.4 | W/O | 2 |
| 60061110 | Machining Technologies | 5 | | ME 12-15.5 | W/O/SP | 4 |
| 40061110 | Product Safety | 5 | | ME 12-15.6 | W/O | 3 |
| | Controlling, Leadership and Corporate Governance | | | ME 12-15.7 | W/O | 3 |
| | Sustainable Energy and Raw Materials Supply | 5 | | ME 12-15.8 | W/O | 3 |
| | Law and Administrative Practice | 5 | | ME 12-15.9 | W/O/SP | 3 |
| | Metal Corrosion and Tribology | 5 | | ME 12-15.10 | W/O/SP | 3 |
| | Powder Metallurgy | 5 | | ME 12-15.11 | W/O/SP | 3 |
| | Non-metal Corrosion and Tribology | 5 | | ME 12-15.12 | W/O/SP | 4 |
| | Surface Technologies | 5 | | ME 12-15.13 | W/O/SP | 4 |

**Examination schedule**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (full-time) Major: Industrial Heritage Conservation

**Compulsory modules** Programme enrolment: Winter semester

| Exam number | Module for the study programme | CP | Exam prec. | Exam event | Exam type | Semester |
|---|---|---|---|---|---|---|
| | **Management Skills** | **10** | | | | |
| 40265130 | Health and Safety, Environmental Aspects 2 | 5 | | ME 1 | W/O | 1 |
| 40035100 | Project and Risk Management | 5 | | ME 2 | W/O/SP | 1 |
| | **Trans-disciplinary modules** | **25** | | | | |
| 40035110 | Cultural History and Sustainable Theory | 5 | | ME 3 | W/O/SP | 1 |
| 40035120 | Aging - Simulation and Practice | 5 | | ME 4 | W/O/SP | 1 |
| 40035130 | Consolidation in Practice: Damage Analysis | 5 | | ME 5 | W/O/SP | 2 |
| 40035140 | Heritage Conservation and Conservation Ethics | 5 | | ME 6 | W/O/SP | 2 |
| 40035150 | Building Materials in Construction and Architecture | 5 | | ME 7 | W/O/SP | 2 |
| | **Major: Industrial Heritage Conservation** | **40** | | | | |
| 51035100 | Industrial Heritage | 5 | | ME 8 | W/O/SP | 1 |
| 51035110 | Building Archaeology and Constructive Conservation | 5 | | ME 9 | W/O/SP | 3 |
| 51035120 | Material Cultural History | 5 | | ME 10 | W/O/SP | 2 |
| 51035130 | Theory of the Object / Object and Material | 5 | | ME 11 | W/O/SP | 2 |
| | Compulsory optional module 1 | 5 | | ME 12 | cf. COP | 3 |
| | Compulsory optional module 2 | 5 | | ME 13 | cf. COP | 3 |
| | Compulsory optional module 3 | 5 | | ME 14 | cf. COP | 3 |
| | Compulsory optional module 4 | 5 | | ME 15 | cf. COP | 4 |
| | **Research-oriented modules** | **20** | | | | |
| 40061230 | Communication and Presentation Skills for Industry and Business | 5 | | ME 16 | SP | 1 |
| *40061230 S* | *Communication and Presentation Skills for Industry and Business / Seminar* | | | | | |
| 40035160 | Practice Course: The example Zollverein I | 5 | CA P | ME 17 | W/O/SP | 2 |
| *40035160 V* | *Practice Course: The example Zollverein I lecture* | | | | | |
| *40035160 P* | *Practice Course: The example Zollverein I practical exercise* | | | | | |
| 40035170 | Practice Course: The example Zollverein II | 10 | CA P | ME 18 | W/O/SP | 3 |
| 40035170 P | Practice Course: The example Zollverein II practical exercise | | | | | |
| | **Master's thesis und Final oral examination** | | | | | |
| | Master's thesis | 20 | PC [1] | PME 19.1 | SP | 4 |
| | Final oral examination | 5 | PC [2] | PME 19.2 | O | 4 |
| | **Total study time (without major subjects/compulsory optional modules)** | **120** | | | | |
| | **Total study time per year** | | | | | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

**Recommended compulsory optional modules**

| | **Compulsory optional module** | | | | | |
|---|---|---|---|---|---|---|
| 40061160 | Structural Durability | 5 | CA P | ME 12-15.1 | W/O/SP | 2 |
| *PC40061160* | *PC Structural Durability* | | | | | |
| 40061130 | Advanced Strength of Materials | 5 | | ME 12-15.2 | W/O | 3 |
| 60035100 | Additive Manufacturing | 5 | | ME 12-15.3 | W/O/SP | 2 |
| 40061200 | Manufacturing Technologies | 5 | | ME 12-15.4 | W/O | 2 |
| 60061110 | Machining Technologies | 5 | | ME 12-15.5 | W/O/SP | 4 |
| 40061110 | Product Safety | 5 | | ME 12-15.6 | W/O | 3 |
| | Controlling, Leadership and Corporate Governance | | | ME 12-15.7 | W/O | 3 |
| | Sustainable Energy and Raw Materials Supply | 5 | | ME 12-15.8 | W/O | 3 |
| | Law and Administrative Practice | 5 | | ME 12-15.9 | W/O/SP | 3 |
| | Metal Corrosion and Tribology | 5 | | ME 12-15.10 | W/O/SP | 3 |
| | Powder Metallurgy | 5 | | ME 12-15.11 | W/O/SP | 3 |
| | Non-metal Corrosion and Tribology | 5 | | ME 12-15.12 | W/O/SP | 2 |
| | Surface Technologies | 5 | | ME 12-15.13 | W/O/SP | 4 |

**Examination schedule**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (part-time) Major: Material Engineering

**Compulsory modules** Programme enrolment: Winter semester

| Exam number | Module for the study programme | CP | Exam prec. | Exam event | Exam type | Semester |
|---|---|---|---|---|---|---|
| | **Management Skills** | **10** | | | | |
| 40265130 | Health and Safety, Environmental Aspects 2 | 5 | | ME 1 | W/O | 1 |
| 40035100 | Project and Risk Management | 5 | | ME 2 | W/O/SP | 3 |
| | **Trans-disciplinary modules** | **25** | | | | |
| 40035110 | Cultural History and Sustainable Theory | 5 | | ME 3 | W/O/SP | 1 |
| 40035120 | Aging - Simulation and Practice | 5 | | ME 4 | W/O/SP | 1 |
| 40035130 | Consolidation in Practice: Damage Analysis | 5 | | ME 5 | W/O/SP | 2 |
| 40035140 | Heritage Conservation and Conservation Ethics | 5 | | ME 6 | W/O/SP | 2 |
| 40035150 | Building Materials in Construction and Architecture | 5 | | ME 7 | W/O/SP | 4 |
| | **Major: Material Engineering** | **40** | | | | |
| 50035100 | Metal Corrosion and Tribology | 5 | | ME 8 | W/O/SP | 1 |
| 50035110 | Powder Metallurgy | 5 | | ME 9 | W/O/SP | 5 |
| 50035120 | Non-metal Corrosion and Tribology | 5 | | ME 10 | W/O/SP | 4 |
| 50035130 | Surface Technologies | 5 | | ME 11 | W/O/SP | 4 |
| | Compulsory optional module 1 | 5 | | ME 12 | cf. COP | 2 |
| | Compulsory optional module 2 | 5 | | ME 13 | cf. COP | 5 |
| | Compulsory optional module 3 | 5 | | ME 14 | cf. COP | 4 |
| | Compulsory optional module 4 | 5 | | ME 15 | cf. COP | 6 |
| | **Research-oriented modules** | **20** | | | | |
| 40061230 | Communication and Presentation Skills for Industry and Business | 5 | | ME 16 | SP | 3 |
| 40035160 | Practice Course: The example Zollverein I | 5 | CA P | ME 17 | W/O/SP | 2 |
| 40035170 | Practice Course: The example Zollverein II | 10 | CA P | ME 18 | W/O/SP | 3 |
| | **Master's thesis und Final oral examination** | | | | | |
| | Master's thesis | 20 | PC [1] | PME 19.1 | SP | 5, 6 |
| | Final oral examination | 5 | PC [2] | PME 19.2 | O | 6 |
| | **Total study time (without major subjects/compulsory optional modules)** | **120** | | | | |
| | **Total study time per year** | | | | | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

**Recommended compulsory optional modules**

| | **Compulsory optional module** | | | | | |
|---|---|---|---|---|---|---|
| 40061160 | Structural Durability | 5 | CA P | ME 12-15.1 | W/O/SP | 4 |
| *PC40061160* | *PC Structural Durability* | | | | | |
| 40061130 | Advanced Strength of Materials | 5 | | ME 12-15.2 | W/O | 3 |
| 60035100 | Additive Manufacturing | 5 | | ME 12-15.3 | W/O/SP | 4 |
| 40061200 | Manufacturing Technologies | 5 | | ME 12-15.4 | W/O | 2 |
| 60061110 | Machining Technologies | 5 | | ME 12-15.5 | W/O/SP | 4 |
| 40061110 | Product Safety | 5 | | ME 12-15.6 | W/O | 3 |
| | Controlling, Leadership and Corporate Governance | | | ME 12-15.7 | W/O | 3 |
| | Sustainable Energy and Raw Materials Supply | 5 | | ME 12-15.8 | W/O | 3 |
| | Law and Administrative Practice | 5 | | ME 12-15.9 | W/O/SP | 3 |
| | Industrial Heritage | 5 | | ME 12-15.10 | W/O/SP | 3 |
| | Building Archaeology and Constructive Conservation | 5 | | ME 12-15.11 | W/O/SP | 3 |
| | Material Cultural History | 5 | | ME 12-15.12 | W/O/SP | 4 |
| | Theory of the Object / Object and Material | 5 | | ME 12-15.13 | W/O/SP | 2 |

**Examination schedule**

**Master Programme: Material Engineering and Industrial Heritage Conservation** (full-time) Major: Material Engineering

**Compulsory modules** Programme enrolment: Winter semester

| Exam number | Module for the study programme | CP | Exam prec. | Exam event | Exam type | Semester |
|---|---|---|---|---|---|---|
| | **Management Skills** | **10** | | | | |
| 40265130 | Health and Safety, Environmental Aspects 2 | 5 | | ME 1 | W/O | 1 |
| 40035100 | Project and Risk Management | 5 | | ME 2 | W/O/SP | 1 |
| | **Trans-disciplinary modules** | **25** | | | | |
| 40035110 | Cultural History and Sustainable Theory | 5 | | ME 3 | W/O/SP | 1 |
| 40035120 | Aging - Simulation and Practice | 5 | | ME 4 | W/O/SP | 1 |
| 40035130 | Consolidation in Practice: Damage Analysis | 5 | | ME 5 | W/O/SP | 2 |
| 40035140 | Heritage Conservation and Conservation Ethics | 5 | | ME 6 | W/O/SP | 2 |
| 40035150 | Building Materials in Construction and Architecture | 5 | | ME 7 | W/O/SP | 2 |
| | **Major: Material Engineering** | **40** | | | | |
| 50035100 | Metal Corrosion and Tribology | 5 | | ME 8 | W/O/SP | 1 |
| 50035110 | Powder Metallurgy | 5 | | ME 9 | W/O/SP | 3 |
| 50035120 | Non-metal Corrosion and Tribology | 5 | | ME 10 | W/O/SP | 2 |
| 50035130 | Surface Technologies | 5 | | ME 11 | W/O/SP | 2 |
| | Compulsory optional module 1 | 5 | | ME 12 | cf. COP | 3 |
| | Compulsory optional module 2 | 5 | | ME 13 | cf. COP | 3 |
| | Compulsory optional module 3 | 5 | | ME 14 | cf. COP | 3 |
| | Compulsory optional module 4 | 5 | | ME 15 | cf. COP | 4 |
| | **Research-oriented modules** | **20** | | | | |
| 40061230 | Communication and Presentation Skills for Industry and Business | 5 | | ME 16 | SP | 1 |
| 40035160 | Practice Course: The example Zollverein I | 5 | CA P | ME 17 | W/O/SP | 2 |
| 40035170 | Practice Course: The example Zollverein II | 10 | CA P | ME 18 | W/O/SP | 3 |
| | **Master's thesis und Final oral examination** | | | | | |
| | Master's thesis | 20 | PC [1] | PME 19.1 | SP | 4 |
| | Final oral examination | 5 | PC [2] | PME 19.2 | O | 4 |
| | **Total study time (without major subjects/Compulsory optional modules)** | **120** | | | | |
| | **Total study time per year** | | | | | |

[1] at least 70 CP

[2] Master's thesis at least graded as sufficient/4.0 (written form)

**Recommended compulsory optional modules**

| | **Compulsory optional module** | | | | | |
|---|---|---|---|---|---|---|
| 40061160 | Structural Durability | 5 | CA P | ME 12-15.1 | W/O/SP | 2 |
| *PC40061160* | *PC Structural Durability* | | | | | |
| 40061130 | Advanced Strength of Materials | 5 | | ME 12-15.2 | W/O | 3 |
| 60035100 | Additive Manufacturing | 5 | | ME 12-15.3 | W/O/SP | 2 |
| 40061200 | Manufacturing Technologies | 5 | | ME 12-15.4 | W/O | 2 |
| 60061110 | Machining Technologies | 5 | | ME 12-15.5 | W/O/SP | 4 |
| 40061110 | Product Safety | 5 | | ME 12-15.6 | W/O | 3 |
| | Controlling, Leadership and Corporate Governance | 5 | | ME 12-15.7 | W/O | 3 |
| | Sustainable Energy and Raw Materials Supply | 5 | | ME 12-15.8 | W/O | 3 |
| | Law and Administrative Practice | 5 | | ME 12-15.9 | W/O/SP | 3 |
| | Industrial Heritage | 5 | | ME 12-15.10 | W/O/SP | 3 |
| | Building Archaeology and Constructive Conservation | 5 | | ME 12-15.11 | W/O/SP | 3 |
| | Material Cultural History | 5 | | ME 12-15.12 | W/O/SP | 2 |
| | Theory of the Object / Object and Material | 5 | | ME 12-15.13 | W/O/SP | 2 |

# Module description

Technische Hochschule Georg Agricola

Technische Hochschule Georg Agricola

## Master programme Material Engineering and Industrial Heritage Conservation

## C. Module handbook (excerpt of Appendix 8 of the Examination regulations)

**Bochum, 15.03.2022**

## Content: overview of modules (in alphabetical order)

| | |
|---|---|
| Additive Manufacturing<br>Advanced Strength of Materials<br>Aging – Simulation and Practice<br>Building Archaeology and Constructive Conservation<br>Building Materials in Construction and Architecture<br>Communication and Presentation Skills for Industry and Business<br>Consolidation in Practice: Damage Analysis<br>Controlling, Leadership and Corporate Governance<br>Cultural History and Sustainable Theory<br>Machining Technologies<br>Health and Safety, Environmental Aspects 2<br>Heritage Conservation and Conservation Ethics<br>Industrial Heritage<br>Law and Administrative Practice Manufacturing Technologies<br>Master's thesis und Final oral examination<br>Material Cultural History<br>Metal Corrosion and Tribology | Non-Metal Corrosion and Tribology Powder Metallurgy<br>Practice Course: The example Zollverein I<br>Practice Course: The example Zollverein II<br>Product Safety<br>Project and Risk Management Structural Durability Surface Technologies<br>Sustainable Energy and Raw Materials Supply<br>Theory of the Object / Object and Material |

# Module description

## Additive Manufacturing

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | AM | |
| Subtitle (if given): | | |
| Courses (if given): | Additive Manufacturing | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory optional module of the programme MEIHC | |
| Forms of teaching/ weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | This module aims at providing a basic understanding of the various additive manufacturing processes for metallic and plastic components. The students will acquire know-how about generating manufacturing data (pre-processing) and the common additive processes (such as selected laser melting, laser sintering, fused layer modelling, filament printing, etc.). They will be able to do the following: compare the processes for different applications; evaluate them comparatively and select them concerning their respective strengths and weaknesses. In addition, the students will learn the post-processing steps that are common and necessary in additive manufacturing and how to apply them. | |
| Content: | Common plastic and metal-based printing processes, suitable metallic materials and plastics, usable energy sources, pre- and post-processing steps, evaluation of the most common processes. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

## Aging – Simulation and Practice

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | ASP | |
| Subtitle (if given): | | |
| Courses (if given): | Aging – Simulation and Practice | |
| Semester: | Full-time: Winter semester<br>Part-time: Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/ weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Students will be able to describe aging mechanisms of materials, especially metals and plastics, and to estimate their influence on the respective useful economic life. They will gain competencies in laboratory experiments for the time-shortened simulation of degradation processes and can investigate the material changes thus produced using analytical and measurement methods. The students, from the correlation of results of the component examinations and the aging simulation, can draw conclusions about the aging processes taking place, the further development of damage and possible methods to prevent damage. | |
| Content: | Various aging processes and their effects on surfaces and volumes; simulation tests; methods for testing aging resistance and application-specific solutions of aging protection. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

## Advanced Strength of Materials

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | HFL | |
| Subtitle (if given): | | |
| Courses (if given): | Advanced Strength of Materials | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr.-Ing. Jan Camphausen | |
| Language | German | |
| Assigned to curriculum as: | Compulsory module of the programme MMB<br>Compulsory optional module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | 2 |
| | Seminaristic teaching: | |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | Fundamental knowledge in the fields of Structural analysis and Strength/stability, Dynamics and Machine Elements | |
| Module objectives/learning objectives aimed at: | Regarding the performance of comprehensive strength verifications, the graduates will first gain an overview of their essential components "system analysis", "load calculation", "stress calculation" and " load capacity calculation" and recognise the general background of how associated calculation models are formed. Furthermore, the fundamental difference between the verification concepts based on nominal stresses and local notch stresses will become clear to them at the beginning by means of illustrative calculation examples. In the field of system analysis, graduates will be able to convert complex real technical systems into manageable calculation models and be aware of the consequences of simplifications made in this context concerning the evaluation of the subsequent calculation results.<br>Assuming external loads acting on the system, they can then use the model structure to calculate the loads occurring at the interfaces of the individual components and, in a next step, convert these into internal component loads as internal forces. | |

# Module description

| | |
|---|---|
| | Advanced Strength of Materials ctd.<br><br>In this context, too, they will independently study the effects of simplifying assumptions in the calculation process using practical examples (e.g., comparing discrete load assumptions vs real continuous load distribution) and train their engineering thinking. Furthermore, the graduates will be familiar with the cause, effect and handling of different time-varying loads (impulsive, harmonic and discrete transient stimulations) as well as the background and application of normative load combination tables (e.g., EN 13001).<br>Concerning the transformation of external and internal loads into component stresses (normal stresses due to tension/compression and bending, shear stresses due to shear forces and torsion loads), the graduates will significantly expand and deepen their fundamental knowledge in the course by computational application of the nominal stress concept; they will also be able to consider multi-axial stress conditions by superposition or selection and application of suitable equivalent stress hypotheses. In this context, they will expand and intensify their knowledge in the areas of the tensorial description of stresses and the calculation of surface moments of inertia of complex cross-sectional geometries and, based on this knowledge, will be able to calculate essential parameters of time-varying stresses (stress amplitude, mean stress, stress ratio and related stress gradient).<br>The graduates will consider interference effects due to notches, shoulders, etc. using various examples according to current standards and guidelines (FKM guideline, DIN 743, etc.) within the framework of the nominal stress concept and, in this respect, be able to clearly differentiate between the terms "shape number" and "notch effect number", establishing their relationship on the basis of the support effect, among other things. On the other hand, they have also been able to understand the procedure for determining relevant stress parameters according to the concept with local notch stresses by means of the FEM using various practical examples. To complete a consistent verification concept, the graduates will intensively practise the computational handling of single-stage and multi-stage stresses in the area of load determination with a focus on fatigue strength and, in addition to deepening their basic knowledge regarding the differentiation between material and component stresses, they will also be able to understand the relationship between these stresses. Further to their deeper knowledge of the distinction between material and component stress curves, they will also learn how to create and apply the fatigue strength diagram as per "Haigh", and to apply the amplitude transformation method and the damage accumulation hypotheses according to Miner Original, Miner Modified and Miner Elementary. |

# Module description

| | |
|---|---|
| Content: | Advanced Strength of Materials ctd.<br><br>Continuous concepts of strength verifications; creation and application of system and load models; calculation of external and internal loads; comparison of real continuous and simplifying discrete approaches; impulsive, harmonic and discrete time-varying loads; load combinations; stress models according to the concepts "nominal stresses" and "local notch stresses" (FEM), calculation and superposition of stresses by superposition and suitable equivalent stress hypotheses; characteristic values of time-varying stresses; stress resistance, focus on fatigue strength of single and multi-stage stressed components; differentiation between material and component Woehler line, fatigue strength diagram according to "Haigh", amplitude transformation, damage accumulation according to Miner (original/modified/elementary) |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

## Building Archaeology and Constructive Conservation

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | BACC | |
| Subtitle (if given): | | |
| Courses (if given): | Building Archaeology and Constructive Conservation | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-IHC<br>Compulsory optional module of the programme MEIHC-ME | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Using methods of Building Archaeology will be enabled to record the technical and material conditions of a building or structure: the composition, its assessment, and possible damages. Deformations are precisely mapped using these methods, and their causes can be deduced from the deformation image. Building research also collects data on the technology, material, equipment and value of a building or structure. These data substantiate the reasons why a building is worthy of preservation and which parts are constitutive for this preservation value when communicating with the heritage and monument offices in the different states.<br>Building preservation and structural preservation are sub-disciplines of civil engineering. Knowledge of these methods will provide students with arguments for preserving a building as found rather than replacing large parts or extensively altering the building's physical structure. These arguments include knowledge of how to proceed if a building cannot be calculated according to the new structural methods: one can calculate the building according to | |

# Module description

| | |
|---|---|
| | Building Archaeology and Constructive Conservation ctd.<br>the regulations of the construction period, calculate the stress of the individual parts, or use experimental methods. The foundation of the methods enables the students to guide building research or instruct building and structural designers on measures to be taken. |
| Content: | Firstly, the course begins with an introduction to aspects of civil engineering as they relate to historic structures: What kind of damage can be expected? Secondly, the usual methods of analysis and the information obtained from them are deepened: Documentation, drawings, 3-D scans, rectified photographs. Thirdly, the fundamental issue of the relationship between old and new standards can be addressed: How do you recalculate a construction? On site, at the Zollverein Colliery in Essen (part of the UNESCO's World Heritage Scheme), we will see important examples of calculation and experimental testing. At the end of the course, all the methods learned will be transformed into a logical scheme that will help graduates to choose the right methods and strategies in their future work. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

Technische Hochschule Georg Agricola

## Building Materials in Construction and Architecture

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | BMCA | |
| Subtitle (if given): | | |
| Courses (if given): | Building Materials in Construction and Architecture | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr. rer. nat. Michael Prange | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The students will be able to explain the most important components, the production, the micro-structure, the most important characteristics of the mechanical behaviour and the aging behaviour, the material testing and the fields of application of all relevant building materials.<br>They will be able to comparatively evaluate building materials for different applications and select them according to their specific strengths and weaknesses. The students can design the formula of a standard concrete taking into account technological variables of concrete and check them with regard to compliance with the applicable rules. The students can select suitable materials or design suitable formulations in order to avoid damage processes. | |
| Content: | Mineral binders; aggregates, admixtures and additives for mortar and concrete; concrete; durability of cementitious building materials; concrete repair, wood, natural stone, artificial stones, mortar, masonry. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

## Communication and Presentation Skills for Industry and Business

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | | |
| Subtitle (if given): | | |
| Courses (if given): | Communication and Presentation Skills for Industry and Business | |
| Semester: | Winter semester | |
| Responsible for module | Ass. d. L. Brigitte Markner-Jäger | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module in the programmes MMB, MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | |
| | Exercise: | |
| | Seminar: | 3 |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | CA Seminar | |
| Recommended prerequisites: | Knowledge of technical English acquired in Bachelor courses | |
| Module objectives/learning objectives aimed at: | Graduates will be able to independently develop an engineering topic scientifically through literature research or projects and to assess its economic implications. They can present these contents and problems in written form and in an oral presentation in English to a group of students. They will have knowledge of various presentation techniques and their structure. They will be able to take up arguments from the group in a socially as well as linguistically competent manner and lead discussions. | |
| Content: | The contents of the seminar are based on topics from the previous Bachelor's degree courses, on corresponding topics from the current Master's degree course or on projects from professional activities. Furthermore, the contents also refer to the formal aspects of presenting contents and issues. | |
| Required studying/exam performance, examination types: | Term paper/presentation | |

# Module description

## Consolidation in Practice: Damage Analysis

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | DA | |
| Subtitle (if given): | | |
| Courses (if given): | Consolidation in Practice: Damage Analysis | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr. rer. nat. Michael Prange | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The graduates will be able to characterize the suitability and limitations of materials for different applications based on essential knowledge of materials technology, material groups, individual materials and processes for varying properties which are presented as examples.<br><br>After completing the course, the students will have an in-depth competence in the field of damage analysis and will be able to assess the relevance of important methods in proper damage analysis to a specific case of investigation and to interpret and document the results of the investigation - also in relation to the application.<br><br>The teaching concept includes the practice of cross-sectional skills, especially in the context of actual damages on site. The students will be able to prepare damage analyses, to carry them out independently under supervision, to summarize the results in a report and to present and represent the results afterwards. In particular, group work, communication, argumentation and presentation techniques will be practised. | |

# Module description

| | |
|---|---|
| Content: | Consolidation in Practice: Damage Analysis ctd.<br>Basics of damage analysis; mechanical, thermal, corrosive, tribologically induced damage; damage examples; writing damage reports of damaged components. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

Technische Hochschule Georg Agricola

## Controlling, Leadership and Corporate Governance

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | | |
| Subtitle (if given): | | |
| Courses (if given): | Controlling, Leadership and Corporate Governance | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr. rer. pol. Alfred Niski | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MRPE-PE<br>Compulsory optional module in the programmes MEI, MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | After successful completion of the course students should:<br>• Have an overview of key content of controlling, leadership and corporate governance in internationally active companies<br>• Know how controlling is applied in companies and which key performance indicators from controlling can be used in companies<br>• Be familiar with leadership in companies and understand the key principles of leading employees and teams<br>• Know principles of corporate governance (company management)<br>• Know how to develop and implement corporate strategies<br>• Understand which key performance indicators can help to lead a company | |

# Module description

| | |
|---|---|
| Content: | Controlling, Leadership & Corporate Governance ctd.<br>• Advanced principles of controlling in companies, use for company performance indicators<br>• Leadership in companies<br>• Corporate governance (developing and implementing company strategy, using key performance indicators to lead a company) |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

## Cultural History and Sustainable Theory

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | CHST | |
| Subtitle (if given): | | |
| Courses (if given): | Cultural History and Sustainable Theory | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Cultural History and Sustainable Theory introduces the most important methods of cultural history and their significance for the work of engineers. The working methods of "Industrial Heritage Engineering" are filled with meaning. Sustainable advocacy for industrial heritage can be strengthened argumentatively through holistic thinking, planning, communicating and executing. | |
| Content: | Heritage and sustainability; knowing and applying methods; monument protection and preservation; heritage and the worldwide concept of heritage; archaeology and industrial archaeology; humanities and natural sciences; interdisciplinary thinking and working; trans-disciplinary ways of working; cultural history and heritage in the network of several disciplines. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

Technische Hochschule Georg Agricola

## Machining Technologies

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | ZTE | |
| Subtitle (if given): | | |
| Courses (if given): | Machining Technologies | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr.-Ing. Peter Frank | |
| Language | German | |
| Assigned to curriculum as: | Compulsory optional module in the programmes MMB, MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | |
| | Exercise: | |
| | Seminar: | 3 |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | After successfully completing the course Machining Technologies, students will learn details of the technical and economic performance of cutting manufacturing technologies.<br>Given a workpiece geometry, the students can derive sensible machining steps for the machining production of the workpieces and thus plan a machining production sequence including the necessary machining parameters. They will know the most important interrelationships of the different machining parameters and can thus work out solutions for machining problems which actually arise. They will know the application limits, and the advantages and disadvantages of the processes and can thus select suitable processes for a specific component. The students can draw conclusions about the causes from errors in production and define remedial measures. | |
| Content: | Basics of machining, machinability of hardened materials and composites, latest developments in turning, milling, drilling and grinding, high-speed and high-performance machining (HSC & HPC), | |

# Module description

| | |
|---|---|
| | Machining Technologies ctd.<br>burr formation in machining and its avoidance, mechanical deburring technologies, process monitoring |
| Required studying/exam performance, examination types: | Written exam, oral exam, term paper/presentation |

# Module description

## Health and Safety, Environmental Aspects 2

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | | |
| Subtitle (if given): | | |
| Courses (if given): | Health and Safety, Environmental Aspects 2 | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr.-Ing. Dirk S. Sohn | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module in the programmes MEIHC, MRPE<br>Compulsory optional module in the programmes MEI, MMB | |
| Forms of teaching/weekly lessons: | Lecture: | 1 |
| | Seminaristic teaching: | |
| | Exercise: | 2 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The students acquire knowledge on the institutions and persons active in occupational health and safety and in environmental protection, in particular the health and safety officer and the different environmental officers. They learn to recognise and assess risks and to develop state-of-the-art measures. They will be qualified to work as internal advisors and supporters in areas of occupational health and safety and environmental protection. The students learn to appreciate the enormous importance of occupational health and safety (OHS) and environmental protection for sustainable success in business.<br>This module promotes the application of knowledge acquired in OHS and environmental protection as the students apply methods systematically to selected examples and learn to integrate the groups involved. The design of concepts, systems and processes, e.g., regarding the prevention of accidents in the workplace, is promote by the students analysing and discussing case studies from the world of work and transferring their findings to new situations. The module enhances the competence to recognise gaps in one's | |

# Module description

| | |
|---|---|
| | Health & Safety, Environmental Aspects 2 ctd.<br>own knowledge or methodical approach and to derive project objectives; skills of problem-solving are developed as risk-based approaches are practised. The module, using state-of-the-art measures in OHS and environmental protection, advances the competence to recognise the global, economic, ecological and societal context; in particular, the module builds awareness for students' own professional and moral responsibility which is further supported by study trips to selected companies. |
| Content: | Fundamental competences on the specialist topics are conveyed. At the end of the semester, students will be familiar with the dual occupational health and safety system in Germany and how it is integrated into European law, and they will be able to use relevant regulations to design preventive solutions for processes at work. They will be familiar with the hazard assessment as a fundamental tool to control the company risks of OHS and environmental protection and with the model of how accidents and dis-eases occur. They will work in groups using examples of own concepts for safety at work. |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

## Heritage Conservation and Conservation Ethics

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | PE | |
| Subtitle (if given): | | |
| Courses (if given): | Heritage Conservation and Conservation Ethics | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-IHC<br>Compulsory optional module of the programme MEIHC-ME | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 3 |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | If possible, the seminar Cultural History and Sustainable Theory is to be completed before attending Heritage Conservation and Conservation Ethics. | |
| Module objectives/learning objectives aimed at: | The students will get acquainted with the basic idea of a quality rating/prioritising of historical objects. A distinction is made between a) a value that requires preservation and b) only a general testimonial character that requires no measures. Students will gain an overview of the theory of historic preservation and the practice resulting from it. They will receive a general introduction to the approach of conservators. Practical examples are used to show the testimonial value of a historic object despite the greater aging of individual materials compared to other materials, and what consequences the replacement of components during the history of use has for the testimonial value.<br>The course will also discuss how the claim of owners and developers to continue using a property can lead to a complex web of trade-offs between conservation, rehabilitation, and restoration. | |

# Module description

| | |
|---|---|
| Content: | Heritage Conservation and Conservation Ethics ctd.<br><br>The possible methods are discussed in this course in the context of cultural-historical justification: What is the purpose of preservation? Which objects must one treat and how? To substantiate this question, both practical and theoretical ethics will be presented, discussed, and explored in depth with students: historic preservation history and theory; conservation and restoration with their demarcation; restoration ethics, and issues of original condition. How value that requires preservation can be distinguished from the general historical testimonial character that any old object has. The Venice Charter will always be the anchor of the argumentation. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Industrial Heritage

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | IH | |
| Subtitle (if given): | | |
| Courses (if given): | | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the major MEIHC-IHC<br>Compulsory optional module of the major MEIHC-ME | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 3 |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The course introduces the history of industrialisation as a specific aspect of cultural history. In doing so, it prepares students for a better understanding of values that underpins the concept of sustainable industrial heritage conservation. The course links the aspects of industrial history and conservation to ensure that the need for preservation becomes clear to participants. The course further uses examples to test and explain the methods and working methods of industrial heritage conservation. It demonstrates how industrial heritage is embedded in general cultural history. | |
| Content: | The content works through the following questions: how did the history of industrialisation unfold; how did industrial societies change in the course of tertialisation, and which values of industrial history began to be particularly worth preserving for those involved in the course of these changes? The related topics are: history of technology and industrialisation; industry as a concept and as a process; engineers' preoccupation with industrial plants since 1800; knowledge transfer in industrialisation; steam engines and their development: | |

# Module description

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|---|---|
| | Industrial Heritage ctd.<br>industrial cultural history, industrialisation as opposed to heritage, and industrialisation and heritage. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Law and Administrative Practice

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | LAW | |
| Subtitle (if given): | | |
| Courses (if given): | Law and Administrative Practice | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory optional module of the programme MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The course introduces administrative structures and institutions that deal with the preservation of cultural property, and it informs about their scope of action as well as the opportunities to utilise these institutions for preservation projects. It provides information on the most important laws and their significance for this context. It introduces the basic meaning and effect of these laws as well as the jurisdiction. In the case of administrative institutions, the focus is on the supreme, upper and lower heritage protection authorities as direct contacts, but also on ICOMOS and other international institutions such as, of course, associations and societies of industrial heritage. Practical examples of how the preservation of cultural property has been successfully advocated with institutions and legal rulings round off the range of topics. | |
| Content: | Monument protection and preservation; the concept of heritage; German heritage law, European heritage law, and heritage law worldwide; legal practice; monument protection authorities; international institutions such as ICOMOS, UNESCO, TICCIH; legal | |

# Module description

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|---|---|
| | Law and Administrative Practice ctd.<br>aspects to be considered in the conservation of industrial heritage plants and machinery. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Manufacturing Technologies

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | FT | |
| Subtitle (if given): | | |
| Courses (if given): | Manufacturing Technologies | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr.-Ing. Peter Frank | |
| Language | German | |
| Assigned to curriculum as: | Compulsory module of the programme MMB<br>Compulsory optional module in the programmes MWI, MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | 2 |
| | Seminaristic teaching: | |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | Knowledge of materials technology, technical mechanics, machine elements and construction technology | |
| Module objectives/learning objectives aimed at: | Students will gain detailed knowledge of new developments in manufacturing technologies and will thus be able to select and apply suitable manufacturing processes based on economic and technical criteria. The design of processes, for example to increase process reliability, is strongly fostered by the fact that the students have to analyse and calculate individual process variables in exercises in order to determine the ideal process parameters. The presentation of the results obtained is done both in written and oral form, thus training the students in particular in the technical communication of production engineering problems. In addition, graduates of the module will be able to evaluate the effectiveness of existing manufacturing sequences taking into account technological and economic aspects and, if necessary, substitute conventional manufacturing processes with more productive, and up-to-date processes. | |

# Module description

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|---|---|
| Content: | Manufacturing Technologies ctd.<br>Productive manufacturing processes; presenting selected processes for rapid prototyping, rapid tooling and rapid manufacturing; powder metallurgy and sintering; forming production of complex body parts; body materials; tailored blanks; body drawing, high-pressure forming and its applications; shear cutting, laser cutting and high-speed cutting (HSC). |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

## Master's Thesis and Final Oral Examination (Colloquium)

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | | |
| Subtitle (if given): | | |
| Courses (if given): | 1) Master's thesis<br>2) Final Oral Examination (Colloquium) | |
| Semester: | Winter semester, summer semester | |
| Responsible for module | Industrial Heritage Conservation: N.N Material Engineering: Prof. Prange | |
| Language | German or English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 750h<br>of which presence: of<br>which self-study: 750h | |
| Credit Points (CP): | 25 | |
| Prerequisites defined in Exam. Regulations: | 1) At least 70 CP from the exam performance of the programme<br>2) A master's thesis with a minimum grade of sufficient/pass (written thesis) | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The graduates have acquired advanced knowledge and comprehension of the principles of Industrial Heritage Conservation and Material Engineering. Thus, they are able to identify research needs of the fields of engineering, history and conservation and to explore a question deriving from those as the topic of their Master's thesis; this topic needs to be worked in a structured manner, developing a solution in a given period of time and presenting it in written form (Master's thesis) and then explaining and defending it in oral form (colloquium). They have also acquired a deeper understanding and critical assessment of the state of research and are able to implement those skills in their assignment. They can appreciate the learning efforts required to make progress in application-oriented research and are able to make use of state-of-the-art methodology (innovative and technological) to solve issues including methods applied in other disciplines. | |

# Module description

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|---|---|
| | Master's Thesis/Final Oral Examination ctd.<br><br>The graduates have enhanced (and demonstrated) the skill of specifying and working on specialist tasks that are complex and not fully defined or well-known. They have developed the fundamental skills to contribute to the further development of the discipline in research and practice. With their Master's thesis, they present an independent work from the professional and scientific fields of Industrial Heritage Conservation und des Material Engineering.<br>The graduates are able to communicate complex content and scientific-technical problems from their fields logically and coherently in written and oral form to both specialists and non-specialists, in German and a foreign language. They have also acquired the skill to independently create professional and scientific publications and the critically assess those. They can initiate and organise their own learning and thus they are able to pursue lifelong learning. |
| Content: | 1) The Master's thesis builds on all compulsory and compulsory optional modules. The students will establish a connection between scientific and technical teaching contents and apply these to a practical application. With the Master's thesis, students prove that they are able to independently solve practice-relevant and complex economic and technical problems and to place them in an overall context.<br>2) Graduates will present the results of their Master's thesis, its subject-related foundations, its interdisciplinary connections and its extra-disciplinary references orally or with suitable aids; they will further independently substantiate their arguments and results and assess their significance for practice. |
| Required studying/exam performance, examination types: | 1) PME written thesis (66.7%)<br>2) PME oral exam (33.3%) |

# Module description

## Material Cultural History

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | MCH | |
| Subtitle (if given): | | |
| Courses (if given): | Material Cultural History | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-IHC<br>Compulsory optional module of the programme MEIHC-ME | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 3 |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | Completion of course Cultural History and Sustainable Theory | |
| Module objectives/learning objectives aimed at: | In "Material Cultural History", students achieve an understanding of the historical sciences from the perspective of material history. The components taught are: connection between cultural history, industrial culture, the materials available at a given time, their manufacturing progress and the development of technology. The starting point are the most important materials of industrialisation, namely, coal, iron and plastics. Other components taught are the technical methods used to achieve progress and initiate developments in materials science and materials production. As a result, the participants deepen the methods of historical sciences, summarise and interpret overarching developments. They will be able to critically question and classify them. | |

# Module description

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|---|---|
| Content: | Material Cultural History<br><br>Industrial culture and history; materials and cultural history; the steam engine: iron and coal; glass and steel: construction technology as the historical basis of building history; plastics: development and formation; silicon and semiconductor technology: micromaterials and their preservation as a special case; working methods and knowledge of an interdisciplinary cultural history based on the material object. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Metal Corrosion and Tribology

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | MeC | |
| Subtitle (if given): | | |
| Courses (if given): | Metal Corrosion and Tribology | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-ME<br>Compulsory optional module of the programme MEIHC-IHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | After completing the course, the students will have in-depth competence in the fundamentals of corrosive and tribological material stress as well as the relevant metallic materials or material groups that have a high resistance to corrosion and wear, including the relevant surface technology. The graduates will be able to get involved in the further development, production and processing as well as in the quality assurance of materials with high resistance to corrosion and wear, and they will learn to characterise the of materials for different applications. | |
| Content: | Overview of available metals and their properties; basics of wet corrosion and high-temperature corrosion; basics of tribological material stress; materials for corrosive and wear stress; protective measures through surface technology applications; experimental in-depth study in selected areas. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

Technische Hochschule Georg Agricola

## Non-Metal Corrosion and Tribology

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | NMeC | |
| Subtitle (if given): | | |
| Courses (if given): | Non-Metal Corrosion and Tribology | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-ME<br>Compulsory optional module of the programme MEIHC-IHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The students will acquire in-depth competence in the fundamentals of corrosive and tribological material stress as well as the relevant non-metallic materials or material groups with high resistance to corrosion and wear, including the relevant surface technology. They will be able to become involved in the conservation techniques, further development, production and processing as well as quality assurance of plastics and to characterise the material suitability for various applications. | |
| Content: | Overview of available non-metals, especially plastics and their properties; basics of ageing of plastics; basics of tribological material stress; protective measures through surface technology applications; experimental in-depth study in selected areas. | |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper | |

# Module description

## Powder Metallurgy

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | PMe | |
| Subtitle (if given): | | |
| Courses (if given): | Powder Metallurgy | |
| Semester: | Winter semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-ME<br>Compulsory optional module of the programme MEIHC-IHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | The students will gain the skills to set up powder metallurgy production sequences from the powder to the component; they will also gain knowledge of the metallurgical processes during sintering and how to use these when selecting suitable sintering processes for the production of PM components, taking property and cost aspects into account.<br>They will be familiar with examples of the state of modern research, application examples and have the corresponding technical vocabulary. The students will have the ability to think in a networked and critical way, so that they can transfer knowledge/skills to specific mechanical engineering/engineering problems. In addition, they will acquire in-depth, also interdisciplinary methodological competence and can apply this in a way that is adapted to the situation. | |

# Module description

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| Content: | Powder Metallurgy ctd.<br>Essential process steps and shaping methods of powder metallurgy (powder production, mixing, mechanical alloying, axial and isostatic pressing, metal powder injection moulding, inert gas and vacuum sintering); special forms of compaction (hot isostatic pressing, field-assisted sintering); atomic processes in solid sintering and sintering with liquid phase; application examples and market situation for powder metallurgical semi-finished products and components. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

Technische Hochschule Georg Agricola

## Practice Course: The example Zollverein I

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | ZOLL 1 | |
| Subtitle (if given): | | |
| Courses (if given): | | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr. rer. nat. Michael Prange | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | 1 |
| | Seminaristic teaching: | |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | 3 |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | CA Practical exercise | |
| Recommended prerequisites: | Industrial Heritage | |
| Module objectives/learning objectives aimed at: | This practice-focused course runs over two semesters and includes a wide range of topics to combine the subjects taught in this programme with an important industrial heritage site of the Ruhr area, the coking plant and the colliery of Zollverein. The course concept provides the joint scientific-systematic use of the results of natural and cultural sciences. Students will learn practical methods of description and documentation, and master the planning of analytical methods based on specific problems. They will process historical data and learn to systematically formulate questions that move between natural science and humanities considering a specific historical object in order to properly address the issues of its conservation. | |
| Content: | The plants will be explored and described in detailed on-site inspections. Methods and approaches of analysis will be discussed and determined in the presence of two lecturers, one focusing on technical object research, and one focusing humanities-theoretical object research. Necessary analyses are planned and, if necessary, samples will be taken. The questions for an in-depth investigation in the second part of the course are prepared and | |

# Module description

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| | Practice course Zollverein I ctd.<br>formulated using the advised methods. The history of the site is reviewed. The aim is to gain a general understanding of the colliery and the coking plant as a whole. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Practice Course: The example Zollverein II

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | ZOLL 2 | |
| Subtitle (if given): | | |
| Courses (if given): | | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr. rer. nat. Michael Prange | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | |
| | Exercise: | |
| | Seminar: | |
| | Practical exercise: | 6 |
| | Research-oriented module: | |
| Working hours: | Total working hours: 300h<br>of which presence: 96h<br>of which self-study: 204h | |
| Credit Points (CP): | 10 | |
| Prerequisites defined in Exam. Regulations: | CA Practical exercise | |
| Recommended prerequisites: | Having completed course ZOLL 1 | |
| Module objectives/learning objectives aimed at: | The course ZOLL 2 continues the course ZOLL 1 and focuses on an in-depth cross-disciplinary collaboration of all students using one practical object and its challenges. The participants of this practical course will collaborate in depth across disciplines. They will independently carry out material examinations on materials of the plant (or on comparable, aged materials), and develop conservation concepts as well as concepts for the replacement of materials that are no longer durable. The methods will be independently researched, analysed and selected using reference literature and comparative examples. The students will assess the stability of the system in view of the condition of the materials. They will thus be in a position to prepare the structural calculation to be done by a structural engineer or structural planner and to commission them properly. The preservation concept available for this museum-owned facility will be subjected to a critical examination on the basis of the condition found during the seminar. The construction, technical and economic history of the object will be prepared. The design effect as well as the cultural-historical significance (possibly monument | |

# Module description

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|---|---|
| | Practice course Zollverein II ctd.<br>significance) of the plant will be highlighted. At the end, the students will present their results in papers and learn to critically prepare them for an academic term paper. |
| Content: | Material examinations; conservation concepts and their critical examination; condition analysis; history of construction, technology and economy.<br>With a view to students' Master's thesis, the academic term papers are especially reviewed to see whether a relevant question has been found and followed through argumentatively and whether the reference literature of different subjects has been correctly quoted in footnotes. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

Technische Hochschule Georg Agricola

## Product Safety

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | PS | |
| Subtitle (if given): | | |
| Courses (if given): | Product Safety | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr.-Ing. Guido Schneider | |
| Language | German | |
| Assigned to curriculum as: | Compulsory module in the programmes MMB, MWI<br>Compulsory optional module of the programme MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | 2 |
| | Seminaristic teaching: | |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | In addition to technical aspects of product safety, the graduates of the course will have a broad basic knowledge of the aspects of the significance of standards and directives for the required product safety in the European Economic Area and their interaction, e.g., with national product safety law. In this respect, they will be familiar with the contents of the Machinery Directive and selected other special EU directives and know the requirements resulting for manufacturer-related conformity assessment procedures. Graduates will be aware of the required scope of activities necessary for a safe product in the EEA according to the principle of integrated safety. They will gain insight into the preparation of risk assessment and directive-compliant documentation. Graduates will be able to recognise possible product features are worth protecting so that they can identify and highlight distinctive characteristics. Thus, they will acquire skills to support commercial protection of new products via e.g. patents or trademarks. The module promotes the students' ability to apply knowledge gained in the field of product safety, | |

# Module description

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|---|---|
| | Product Safety ctd.<br><br>i.e., the skills learned in exercises will be independently used by the students to find solutions. The module shapes the students' skills to design concepts, processes and, if applicable, associated systems, considering existing boundary conditions by practising, e.g., the conceptual design of a CE protocol to map interdepartmental relationships for the conformity assessment procedure. Furthermore, the students will learn how to apply analytical instruments such as the risk assessment for machines according to EN ISO 12100 and will be able to define further measures in case of identified deficiencies concerning inherent safety. The students' ability to develop independent solutions to problems is promoted within the module by linking the exercises to decision-making questions where possible. In addition, background information and decision-making criteria are asked. This is practised on concrete product examples. Graduates will obtain knowledge of content classification, in particular looking at the competences of responsibility and safety, as the module teaches, e.g., the aspects of manufacturer responsibility in the EEA and the transfer to a natural person. The graduates will gain insights into content classification concerning the aspect of patentability of new product ideas as characteristic features are formulated within the module's exercises for concrete examples and compared to a possible inventive step. Graduates will thus be able to apply the course content to what they have learned in other application-oriented engineering subjects, such as machine elements or similar, in a way that meets requirements and is profitable as well. |
| Content: | 1. Structure of EEA regulations and their interaction with national regulations<br>2. Areas of application, contents and consequences of EU single market directives relevant to mechanical engineering<br>3. Contents, types, structure and aspects concerning the non-binding nature of harmonised EN standards<br>4. Types of conformity assessment procedures<br>5. Technical documentation, product-accompanying documents of the manufacturer<br>6. Risk assessment with and without software support<br>7. Identification and elaboration of protectable product features<br>8. Structure of patent applications and specifications, employee inventions<br>9. Trademark law |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

Technische Hochschule Georg Agricola

## Project and Risk Management

| | | |
|---|---|---|
| Module level (if given): | | |
| Short form (if given): | PM | |
| Subtitle (if given): | | |
| Courses (if given): | | |
| Semester: | Winter semester | |
| Responsible for module | Prof. Dr. Michael Prange | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h of<br>which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Students will learn and practise goal-oriented planning and execution of technical projects: Therefore, what is taught at first is knowledge about project types, project phases and the participants of a project including their tasks.<br>Forms of project organisation with advantages and disadvantages including the specific activities of the engineers, but especially of the project manager, are discussed. A large part of the course is devoted to process planning within the project stages and project implementation, including the documentation to be prepared and the options for project monitoring. Within the framework of the exercises, the use of project management software is deepened using typical examples. The students will have knowledge of international best practices for project management, based on the recommendations of IPMA and GPM as well as the American Standard ANSI/PMI 99-001-2004 (PMBOK Guide). They will be able to apply various recognised methods of operational project management in their project examples. The students can independently use software tools for project planning and monitoring. | |

# Module description

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|---|---|
| Content: | Project and Risk Management ctd.<br><br>Types of projects; stakeholder analysis; organisational forms; phase concepts for different types of projects; procedure models; feasibility study; project goals; project structure plan; process and schedule planning; network chart, Gantt chart; cost and resource planning; progress control and project control; project completion; project review; contract management; follow-up management; risk management; configuration and change management; document management incl. specifications - offer - requirements specification; quality management for projects; tasks and approaches of the project manager; team leadership; communication; basics of MS Project: activities, resources, basic calendar, project tracking. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

## Structural Durability

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | BF | |
| Subtitle (if given): | | |
| Courses (if given): | Structural Durability | |
| Semester: | Summer semester | |
| Responsible for module | Prof. Dr. rer. nat. Michael Prange | |
| Language | German | |
| Assigned to curriculum as: | Compulsory module of the programme MMB<br>Compulsory optional module of the programme MEIHC | |
| | | |
| Forms of teaching/weekly lessons: | Lecture: | 1 |
| | Seminaristic teaching: | |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | 1 |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | CA Practical exercise | |
| Recommended prerequisites: | Successful completion of foundation courses on subjects of Mathematics, Mechanics and Materials Engineering. | |
| Module objectives/learning objectives aimed at: | This course aims at giving students a comprehensive overview of the strength-related design of structures. The focus is on the stress side as well as the load capacity side. The particular aim of this course is that students will be able to identify and deal with certain specifics within the framework of an assignment. These specifics include: issues of load distribution; linking of operational behaviour and stress conditions; special influences on load capacity; identification of failure mechanisms. Graduates of the submodule can analyse and synthesise structures under strength aspects and use this in the planning processes for components, machines and plants. In addition, graduates can deal with the analysis and evaluation of damage incidents. They recognise the deeper causes of such incidences, can work out measures for remedial action and present and present these in a target-oriented manner to non-experts.<br>The teaching concept includes the practice of cross-sectional qualifications, especially within the framework of practical exercises. In the practical exercises, the students will prepare experiments by | |

# Module description

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| | Structural Durability ctd.<br>reading; carry out the experiments (in parts) independently under guidance; summarise the results in a report, and subsequently present and display the results. Thus, the students will be enabled to design and evaluate experiments in a problem-oriented manner in order to identify deficiencies, among other things, and to define, plan and complete projects. In particular, they will learn and practise the handling of analytical instruments and procedures, teamwork, communication, argumentation and presentation techniques. |
| Content: | Classes of machines and plants, operating behaviour, stress behaviour, load capacity, variables influencing load capacity, creep strength, fatigue strength, fracture mechanics, prognosis of component failure, measures in the event of component failure |
| Required studying/exam performance, examination types: | Written exam, oral exam, term paper/presentation |

# Module description

## Surface Technologies

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| Module level (if given): | | |
| Short form (if given): | ST | |
| Subtitle (if given): | | |
| Courses (if given): | Surface Technologies | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-ME<br>Compulsory optional module of the programme MEIHC-IHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Students will be able to name, distinguish, classify and assess the basics and processes of surface and coating technology. They will acquire the skills to name and present the physical and chemical basics for specific surface properties and to explain, classify and predict surface properties. Students can identify, compare, predict and analyse the properties of different materials and coating systems. They will also learn to compare and question surface technology processes.<br>The students will be able to identify suitable processes and material systems in product development and construction and to select processes, taking into account economic and ecological aspects, in order to specifically create functional surface properties. Above all, they will gain knowledge of industrially relevant and technologically interesting coating processes from technologies such as painting, electroplating and hard material, and will acquire the skills to assess special aspects of layer functionality, quality, economic efficiency and environmental compatibility. | |

# Module description

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| Content: | Surface Technologies ctd.<br>Introduction to surface technology; fundamentals of paint application processes; functional surface properties; pre-treatment processes and equipment; galvanic deposition processes; industrial wet and powder painting processes and equipment. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |

# Module description

Technische Hochschule Georg Agricola

## Sustainable Energy and Raw Materials Supply

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | | |
| Subtitle (if given): | | |
| Courses (if given): | Sustainable Energy and Raw Materials Supply | |
| Semester: | Winter semester | |
| Responsible for module | Dr.-Ing. Dipl.-Wirt.Ing. Stefan Möllerherm | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MRPE<br>Compulsory optional module in the programmes MWI, MEIHC | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | After successful completion of the course students should:<br>• Have an overview of the international raw materials industry<br>• Be familiar with the concept of sustainable development<br>• Know the four sources of sustainable raw materials supply and be able to classify them<br>• Know the process chain of primary raw materials supply and be able to optimise this for the purpose of sustainability<br>• Be aware of the opportunities and limits of recycling and circle economy<br>• Know how to substitute materials and classify new materials as resources<br>• Understand and handle the opportunities and limits of material efficiency<br>This module promotes the application of knowledge acquired in the fields of raw materials production and sustainability by analysing process chains of primary raw materials supply with regard to sustainability and efficient use of resources.<br>The module teaches knowledge on the international raw materials | |

# Module description

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| | Sustainable Energy and Raw Materials Supply ctd.<br>industry, the concept of sustainable development four sources of sustainable raw materials supply to build the competence of understanding the global, economic, ecological and societal context. in particular, the module creates awareness for students' own professional and moral responsibility. |
| Content: | • International raw materials industry<br>• Concept of sustainable development<br>• Primary raw materials supply and sustainability<br>• Recycling and circle economy<br>• Substitution as a resource<br>• Material efficiency as a resource |
| Required studying/exam performance, examination types: | Written exam, oral exam |

# Module description

Technische Hochschule Georg Agricola

## Theory of the Object / Object and Material

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|---|---|---|
| Module level (if given): | | |
| Short form (if given): | ThO | |
| Subtitle (if given): | | |
| Courses (if given): | | |
| Semester: | Summer semester | |
| Responsible for module | TBA | |
| Language | English | |
| Assigned to curriculum as: | Compulsory module of the programme MEIHC-IHC<br>Compulsory optional module of the programme MEIHC-ME | |
| Forms of teaching/weekly lessons: | Lecture: | |
| | Seminaristic teaching: | 2 |
| | Exercise: | 1 |
| | Seminar: | |
| | Practical exercise: | |
| | Research-oriented module: | |
| Working hours: | Total working hours: 150h<br>of which presence: 48h<br>of which self-study: 102h | |
| Credit Points (CP): | 5 | |
| Prerequisites defined in Exam. Regulations: | | |
| Recommended prerequisites: | none | |
| Module objectives/learning objectives aimed at: | Methods of object research are to be prepared for engineers and made usable in their context. The methods used in the humanities and the analytical methods of the natural sciences are both distinguished from each other and clarified with their common goals concerning conservation. The theory of perception (humanities) helps understand that people approach historical buildings, installations and machines individually, but according to supra-individual, similar rules. The methodological knowledge and understanding of supra-individual perception will prepare students for the communication process within heritage conservation. Students will learn to view values and evaluations as immaterial ingredients to the material object, and to distinguish subjective statements from the objective value of a historical object. This will provide them with communicative tools for heritage "management". The scientific methods of object analysis will also be more precisely delineated as further methods of knowledge: the aim of the seminar is to learn to trust systematic methodology more than subjective, intuitive object perception. | |

# Module description

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| Content: | Theory of the Object ctd.<br>What is an object? How do we look at objects? Material objects and immaterial objects; material as a special object property; aesthetic theory as the study of the perception and design of objects; scientific analysis as methods of knowing material and form; state of preservation. |
| Required studying/exam performance, examination types: | Written exam, oral exam, written seminar paper |