CERTIFICATION HANDBOOK
AND EXAMINATION REGULATION

Personnel Certification
Lightweight Materials

Revision 1
Valid from June 2019
CERTIFICATION HANDBOOK AND EXAMINATION REGULATION
Personnel Certification Lightweight Materials

Fraunhofer Personnel Certification Authority
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Foreword

The certification services of the Fraunhofer Personnel Certification Authority in the field »Lightweight Materials« are available for all interested persons. The Fraunhofer Certification Authority guarantees the impartial treatment of all applicants.

Following the guidelines set out in the EN ISO 17024 standard »General Criteria for Personnel Certification Bodies«, this document outlines the personnel certification process in the »Lightweight Materials« field, thus defining a uniform certification system.

At the same time this certification handbook serves as examination regulations for the certification examinations for all certification profiles in the »Lightweight Materials« field.
2 SCOPE

This certification handbook covers personnel certification by the Fraunhofer Personnel Certification Authority in the »Lightweight Materials« field and also serves as examination regulations for all certification profiles in the »Lightweight Materials« field.

Personnel certification in the »Lightweight Materials« field is based on the certification profiles:
- »Lightweight Professional Basic Level«
- »Lightweight Professional Advanced Level«
- »Lightweight Professional Expert Level«

Figure 1: Relationships between certification profiles and corresponding learning content in the field of »Lightweight Materials«

Figure 1 shows how the topics of the learning targets of each certification profile fit in the certification system that includes a basic, advanced and expert level.

Applicants who want to obtain the certificate
- »Lightweight Professionals Basic Level« have to prove all the competences (learning targets) mentioned in annex A.
- »Lightweight Professionals Advanced Level« have to prove the competences (learning targets) of at least four out of six topic areas described in annex B (to be developed).
- »Lightweight Professionals Expert Level« have to prove the competences (learning targets) of at least four out of six topic areas described in annex C (to be developed).

The specifications of the certification profiles, as detailed in the annexes, are constituent parts of the respective personnel certification. As of June 2019, certifications are carried out only for the basic level profile.
GENERAL TERMS

Fraunhofer Personnel Certification Authority
Body in the Fraunhofer-Gesellschaft that certifies that an applicant’s actual knowledge and skills (qualification) satisfy normative requirements.

Board of examiners
Body of examiners who administer and grade the examination on which a certification is based.

Examiner
Experts who test applicants on behalf of the Fraunhofer Personnel Certification Authority. They perform this function guided only by their professional expertise. They are familiar with the full scope of subjects taught and tested.

Secretaries
Persons who, on behalf of the Fraunhofer Personnel Certification Authority, take minutes at examinations in accordance with the regulations of this certification handbook. They are subordinate to the examiners.

Expert Committee (EC)
Committee of experts that is appointed by the Fraunhofer Personnel Certification Authority. The tasks of the committee are the following: verification and validation of examination content, creation of examination questions, responsible authority for professional requests and consulting for the Fraunhofer Personnel Certification Authority in terms of the professional quality of the examiners. Full particulars in terms of the tasks and competences can be found in the «internal rules of procedure of the expert committee». An expert committee will be formed for each certification profile.

Certification program
Certification Program denotes the total of certification profiles in a given field. The present certification handbook describes the certification programs in the »Lightweight Materials« field. Certification programs consist of several certification profiles. They are detailed in annexes.

Certification profile
Certification Profile denotes a specific level of qualification that can be certified in the »Lightweight Materials« certification program. The certification profiles of the »Lightweight Materials« certification program are: »Lightweight Professional Basic Level«, »Lightweight Professional Advanced Level«, »Lightweight Professional Expert Level«.

Term »know«
Corresponds to the first and second level of Bloom’s six-level taxonomy of educational objectives (Bloom, B. S.: Taxonomy of Educational Objectives, 1974). It is characterized by repetition from memory triggered by keywords. Relevant skills are to know, to recognize and to emulate.

In examinations in the »Lightweight Materials« field, the objective »to know« refers to different subjects in the different certification profiles. These different subjects are listed in the annexes to this document.
**Term »apply«**
Is a synonym for the Reorganization level of educational goals. Corresponds to the third and fourth level of Bloom’s taxonomy of educational objectives. It is characterized by the individual processing and reorganizing of a subject. Relevant cognitive skills are to understand, to react and to practice.
In examinations in the »Lightweight Materials« field, the objective »to apply« refers to different subjects in the different certification profiles. These different subjects are listed in the annexes to this document.

**Term »evaluate«**
Is a synonym for the Transfer and Problem Solving level of educational goals. Corresponds to the fifth and sixth level of Bloom’s taxonomy of educational objectives. It is characterized by the transfer of basic principles to new, similar tasks or activities unfamiliar to the learner. Relevant cognitive skills are to apply, to judge, to coordinate or solve problems, to automate.
In examinations in the »Lightweight Materials« field, the objective »to evaluate« refers to different subjects in the different certification profiles. These different subjects are listed in the annexes to this document.
ORGANIZATION OF THE CERTIFICATION PROCESS

This section describes in detail the organization of the certification process.

4.1 Goal

Certifications examine if criteria of the actual qualifications of an applicant satisfy well-defined profiles of required qualifications, and document the results in a certificate of competence.

4.2 Language

The official languages to communicate with the Fraunhofer Personnel Certification Authority are German or English. All official documents within the certification process are English (application form, certificates, etc.).

The examinations are held in the following languages (depending on the date and place of the examination): English, German, Spanish and Italian. All documents needed during the examinations will be provided in the corresponding language.

4.3 Application

Certificates will be granted to applicants who pass an examination on the subject of »Lightweight Materials«, organized by the Fraunhofer Personnel Certification Authority, and who satisfy the admission requirements defined in the annexes to this certification handbook.

Applicants who want to take a (re-) certification must apply in writing to the Fraunhofer Personnel Certification Authority. The application must provide the following information about the applicant:

- Name, date of birth, private address.
- Occupation, job title
- Relevant certification profile
- Indication whether the applicant seeks a first-time certification, re-certification or re-examination.

Eligible for certification are all persons that have successfully passed an examination of the Fraunhofer Personnel Certification Authority in the field of »Lightweight Materials« and that meet the defined admission requirements according to the annexes of this certification handbook.

4.4 Admission to the examination

Applicants that have submitted a complete application and proof of fulfilling all admission requirements are admitted to the examination. The specific admission requirements for each certification profile are detailed in the respective annexes to this document.

Qualifications deemed equivalent to these admission requirements may be accepted by the Fraunhofer Personnel Certification Authority if the applicant submits sufficient proof.
4.5 Date and location of the examination

Examination dates are set by the Fraunhofer Personnel Certification Authority. As a rule, examinations will be administered immediately following a course covering the respective certification profile, held by an organization approved by the Fraunhofer Personnel Certification Authority.

Examinations will be held in locations admitted by the Fraunhofer Personnel Certification Authority, normally in the facilities of a course provider approved by the Fraunhofer Personnel Certification Authority.

4.6 Examination procedure

This chapter describes the organization of the examination.

4.6.1 Provision of the documents for the examination and assignment of examiners

The Fraunhofer Personnel Certification Authority provides the examiners with the questions and task descriptions for the certification examination, selected from a set of questions and task descriptions for the certification profile validated by the responsible expert committee.

The Fraunhofer Personnel Certification Authority will provide the exam questions in time for the board of examiners to administer the examination at the date set. Questions and task descriptions will be communicated safe from unauthorized access.

The head of the Fraunhofer Personnel Certification Authority commissions the board of examiners to administer the examination.

4.6.2 Board of examiners

The members of the board of examiners are mandated by the Fraunhofer Personnel Certification Authority to administer the examinations. The chairperson and members of the board of examiners must not have acted as instructors/teachers of the examinee.

In written examinations (Basic Level, Advanced Level and Expert Level), the board of examiners consists of

- One examiner who satisfies the requirements described in the document »Competence Profile Examiner Written Examinations Lightweight Materials« and is responsible for administering and grading the written examination.
- One examiner who satisfies the requirement described in the document »Competence Profile Examiner Written Examinations Lightweight Materials« who evaluates the results.

In oral examinations (Advanced Level and Expert Level) the board of examiners consists of

- A chairperson or deputy chairperson who both satisfy the requirements described in the document »Competence Profile Examiner Oral Final Examination Lightweight Materials« (responsible for administering and grading the oral examination)
An examiner who satisfies the requirements described in the document
»Competence Profile Examiner Oral Final Examination Lightweight Materials«
(responsible for administration and grading of the oral examination)

Besides the board of examiners, the Fraunhofer Personnel Certification Authority
appoints a secretary (see competence profile »Secretary«) who keeps records of
the examination. The secretary is not a member of the board of examiners and
thus has no say concerning the examination and its results.

Concerning all certification profiles, the board of examiners is tasked with:

- Administering and grading the written, oral and practical examinations
- Evaluating the examination results
- Keeping records of the examination and its results

### 4.6.3 Administration of the written examinations

Written examinations are executed in all certification profiles within the scope of
»Lightweight Professional«.

Applicants who want to obtain the certificate

- »Lightweight Professional Basic Level« will have one written examination
  covering all competences (learning targets) mentioned in annex A.
- »Lightweight Professional Advanced Level« will have four written
  examinations; one examination in each of the four topic areas which have to
  be chosen in order to obtain the certification (four electives). The examinations
  cover the competences (learning targets) of the electives described in annex B
  in each case (to be developed).
- »Lightweight Professionals Expert Level« will have four written examinations;
  one examination in each of the four topic areas which have to be chosen in
  order to obtain the certification (four electives). The examinations cover the
  competences (learning targets) of the electives described in annex B in each
  case (to be developed).

Written examinations will be held in locations approved by the Fraunhofer Personnel
Certification Authority.

The written examinations (one for each elective) test (by multiple-choice questionnaire)
the candidate’s knowledge of the respective elective of the »Lightweight Materials«
profile. The examination questions are chosen from a pool of questions that cover all
the topics that must be tested in the elective. The examination questions are defined by
the expert committee and made available to the examiners by the Fraunhofer Personnel
Certification Authority

The written examination has to be answered by hand. It will be ensured that there is
enough time available to answer the examination questions. For this, the examination
committee will evaluate how much time is required to answer the questions when
preparing the examination.

Alternative means of answering the questions, for example, using a computer, are not
allowed.

For candidates who, due to a handicap, cannot take the examination in its normal
form, individual exceptions may be agreed. Permission to use for example alternative
means to answer examination questions shall be decided on a case-by-case basis by the
Fraunhofer Certification Authority.
4.6.4 Administration of the oral examination (final examination)

Oral examinations are administered within the certification profile »Lightweight Professional Expert Level«.

To be admitted to the oral examination, the applicant has to submit the examination results of all electives.

The oral examinations will cover all the competences (learning goals) of the electives of the respective certification profile (Advanced Level or Expert Level).

Oral examinations (final examinations) are administered for groups of candidates (two candidates). In the case of an odd number of candidates for an examination, a candidate may choose to be examined individually or in a group of three candidates. A group size greater than three candidates is not allowed.

The oral examination will last no less than 30 minutes and no more than 35 minutes.

At the start of the examination the questions are chosen at random by the candidates from a pool of questions for the oral examination. This pool of examination questions contains questions covering all chosen subjects of the respective levels. The questions are defined by the Expert Committee »Lightweight Materials« or its working groups, and provided to the examiners by the Fraunhofer Personnel Certification Authority.

The questions and the candidate’s answers are documented in abbreviated form in the minutes of the examination by the secretary, and verified by the signature of the chairperson of the board of examiners.

Aids are not admitted.

For candidates who, due to a handicap, cannot take the examination in its normal form, individual exceptions may be agreed.

4.7 Examination questions and tasks

The catalogue of examination questions is different for each certification profile. The same number of questions shall be asked for different subject areas and electives.

The questions are clearly assigned to the different certification profiles and subject areas. Questions may only be asked to participants with the corresponding qualification profile.

4.8 Grading and evaluation of the examination

The participants have to achieve a minimum degree of performance of 67 % in each of the examination (written exams and/or oral exams). If this is not the case, no certificate will be issued.

Written examinations:
The examiners will be provided with the right answers of the questions. The answers are defined by the expert committee.
**Oral examinations:**
For each question and task the examiners will be provided with sample solutions which will be used as guideline for the evaluation of the question at hand. Additionally, the expert committee fixes the achievable scores for each question or task.

The examination results are decided by the board of examiners and communicated to the Fraunhofer Personnel Certification Authority.

**Report card**
The examination results are documented in a report card issued to the candidates by the Fraunhofer Personnel Certification Authority. The report card is issued only in combination with a certificate.

4.9 **Re-examination**

Failed examinations may be repeated twice. Re-examination covers only the parts graded ‘fail’.

The first re-examination must be taken within 18 months after the failed (part of an) examination. The second re-examination must be taken within 6 months after the first re-examination. If the candidate fails to take the re-examination within these periods, a new certification process must be applied for.

If a candidate fails three times, a new certification process must be applied for.

4.10 **Certification**

After having passed all necessary examinations for the respective certification profile and submitted proof of fulfilling the admission requirements, the applicant will be awarded the certification for her/his certification profile by the Fraunhofer Personnel Certification Authority.

Applicants may submit proof of professional experience or graduation within one year after passing the certification examination. The certificate will be awarded as soon as all certification requirements are fulfilled. The certificate must be awarded not later than one year after the candidate passed the last part of the examination.

The validity of the certificate starts on the date of the decision by the head of the Fraunhofer Personnel Certification Authority to award the certificate and ends three years minus one day after the last examination.

To extend the validity of a certificate, a re-certification is required. The conditions for re-certification are detailed in the Re-certification section. The form of proof is part of the quality management system of the Fraunhofer Personnel Certification Authority.

4.11 **Monitoring**

Certifications in the »Lightweight Materials« field are not monitored during the validity of the certificate.
4.12 Re-certification

The certificates of all certification profiles need to be renewed before they expire three years minus one day after the last part of the certification examination – re-certification.

The goal of re-certification is:
Proof that the certified person has kept up-to-date her/his professional knowledge and skills.

Re-certification therefore requires proof of relevant work experience during the last three years before re-certification and proof of participation in professional further education.

Within 2 years and 2.5 years after the last examination (one year to six months before the certificate expires), the certified person must file an application for re-certification with the Fraunhofer Personnel Certification Authority. Furthermore, the formal proof of work experience and professional further education must be filed within this period.

In exceptional cases (e.g. illness of the certificate holder) additional time may be granted for re-certification. The decision to grant an extension rests with the head of the Fraunhofer Personnel Certification Authority.

Proof of work experience can, for example, be a formal letter from an employer.

Proof of participation in further professional training is to be by certificate of attendance filled in by the provider of the professional education. Events of professional further education are eligible if the provider is approved by the Fraunhofer Personal Certification Authority, the event has a duration of at least one day and it consists of at least three modules that are relevant for lightweight material subjects.

If the requirements for re-certification are satisfied, the validity of the certificate is extended by three years minus one day.

If the requirements for re-certification are not satisfied, the validity of the certificate expires. The (former) certified person needs to go through a new certification process (see initial certification).
5 RIGHTS AND OBLIGATIONS

(As of October 2018)

The issuance of the Certificate is associated with rights and obligations, which we would like to point out in advance. If you do not agree with the application of the following regulations, participation is not advisable. You will later be handed a copy of these regulations along with the Certificate.

5.1 Disclosure

It is possible to obtain information concerning the entitlement of a person that has passed the certification successfully, if the number of the certificate is given (e.g. from potential employer of the mentioned person). To identify the mentioned person, it is necessary to ask for the name, birthday and place of birth. We will compare this information with the Personal Data stored concerning this person (name, birthday, place of birth). Afterwards we confirm the lawfulness positively or negatively, without passing any Personal Data.

The comparison is based on Art. 6 I 1 f GDPR. It is used to prevent the misuse of our certificates, so it is necessary to protect our legitimate interest according to the aforementioned provision.

5.2 Rights

Within the scope of his/her occupation in the field of „Lightweight Materials“, the Certificate Holder is entitled to

- refer to his/her certification and the certifying authority on letterheads, on the internet and other printed documents in the following way: certified „NAME OF THE CERTIFICATE“, approved by the Fraunhofer Personnel Certification Authority“ or certified „NAME OF THE CERTIFICATE“ (e.g. certified Lightweight Professional Basic Level). By using Alternative 1, he/she shall check that the designation of „approved by the Fraunhofer Personnel Certification Authority“ does not appear bigger than the name of the certified person.
- use the certificate as a whole referring to the certification
- view the document „Certification Handbook and Rules of Procedure – Personal Certification Lightweight Materials“, which explains the certification system of the Fraunhofer Personnel Certification Authority at Fraunhofer FIT.

Further details: see Section 5.3

5.3 Obligations

The certificate holder shall comply with following principles:

5.3.1 Diligence

The Certificate Holder shall exercise his/her occupation in accordance with the »State of the Art« in the field of »Lightweight Materials«. The quality of a product is the foremost principle of all action.
RIGHTS AND OBLIGATIONS

5.3.2 Independence

The Certificate Holder shall act without regard to official relations within the company and/or its employees or their desired results (personal independence).

5.3.3 Personal performance

The Certificate Holder shall perform all required services with regard to preparation, execution and evaluation of usability projects in person. He/she shall not use the deed of the certification falsely or in any misleading way.

5.3.4 Permitted use of certificates

The following regulations shall also apply for the use of certificates:

- The certificate shall be granted to the certificate holder. The actual certificate/document shall remain the property of the Fraunhofer Personnel Certification Authority.
- Only valid certificates shall be used.
- The certificate shall not be used inappropriately.
- The certificate shall be returned to the certification board
  - after expiration of the certificate,
  - after the Certification holder has been informed by the Fraunhofer Personnel Certification Authority about withdrawal
- In case of suspension, withdrawal or lapse of the certification the Certification holder shall immediately cease the use of the certificate. References of the Certification holder to the certification and/or the Fraunhofer Personnel Certification Authority shall be removed immediately. In this event letterhead or other printed material shall be destroyed immediately or in case of suspension shall not be used during suspension.
- The use of the certificate and references to it are only permitted if the observer explicitly recognizes who has been examined and certified.
- By using the certification or making references to it he/she shall not give the impression that the certified person is an employee of Fraunhofer-Gesellschaft or that he/she acts on behalf of Fraunhofer-Gesellschaft.
- The Certificate holder is responsible for the correct use of the Certificate. Possible doubts shall be the responsibility of the Certificate holder.

5.3.5 The use of Fraunhofer logo

The certificate of the Fraunhofer Personnel Certification Authority contains the Fraunhofer-Logo. The Logo shall exclusively be used as a part of the certificate in that way that the certificate as a whole may be copied or made available in the internet as proof of the issuing certification board for e.g. clients or employers. Any further use beyond this of the Fraunhofer-Logo or the use of the name Fraunhofer as trade mark is expressly prohibited.

In case of violation Fraunhofer-Gesellschaft is entitled to apply for injunctive relief or damage claims.

5.3.6 Duty to give notice

The certificate holder shall notify the Fraunhofer Personnel Certification Authority without delay of:
5.3.7 Duty to disclose

Upon request of the Fraunhofer Personnel Certification Authority at Fraunhofer FIT, the Certificate Holder shall disclose and furnish all necessary particulars and documents regarding the monitoring of activities and compliance with the aforementioned duties within a set deadline and without compensation.

He/she may refuse to provide self-incriminating information or such information that may incriminate his/her relatives.

5.3.8 Violation to duties as certificate holder

Depending on the gravity of the violation of a duty stated in this document may be suspended or revoked. The former Certificate Holder is then no longer entitled to refer to his/her certification.
Annex A: »CERTIFIED LIGHTWEIGHT PROFESSIONAL
BASIC LEVEL«

A 1 Reference to other norms and documents

EN ISO 17024

A 2 Profile of qualification

A 2.1 Determination

The qualification profile of a »Certified Lightweight Professional Basic Level« results from the characteristics and description of his or her field of work.

The responsibility of a »Certified Lightweight Professional Basic Level« is to identify and differentiate the steps involved in developing lightweight products, and to use (design, construct and set up processes with) specific lightweight materials in the correct way to fully utilize the lightweight potential

A »Certified Lightweight Professional Basic Level«:

identifies and differentiates the different steps in the process to develop a product in order to critically assess the advantages and disadvantages of lightweight design for specific cases and different materials.
identifies company key figures and components to develop products using a lightweight approach (designers, buyers and quality personnel).

A 2.2 Admission requirements

A 2.2.1 Previous education

All applicants must have sufficient competence in the language of the examination in order to be able to understand and answer the questions.

A certified »Lightweight Professional Basic Level« must prove:

Participation in a professional training of at least 40 hours which is approved by the Fraunhofer Personnel Certification Authority and includes all learning targets mentioned below (see chapter »Required competences (learning targets) «).

Note:
In special cases the applicant has the possibility to prove missing admission requirements within one year after taking the examination.

After examination of the submitted documents, the Fraunhofer Personnel Certification Authority will decide on the requirements. If entry requirements are not fulfilled, the Fraunhofer Personnel Certification Authority will directly communicate the decision to the applicant.

In principle, the Fraunhofer Personnel Certification Authority may in well-founded and justifiable exceptions accept varying evidence. These evidence, documents and decisions of the Fraunhofer Personnel Certification Authority have to be documented.
A 2.2.2 Additional education, entitlement and practical experience

A »Certified Lightweight Professional Basic Level« does not have to prove any additional education, entitlement or practical experiences.

A 2.2.3 Personal requirements

None.
### A 2.3 Required competences (learning goals)

A »Certified Lightweight Professional Basic Level« has to be able to prove the following competences:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Requested competences (learning targets)</th>
<th>know</th>
<th>apply</th>
<th>evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Lightweight Professional Basic Level has to be able to...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Introduction into lightweight design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightweight design in the contradictory context between ecological, economical and cost related requirements</td>
<td>explain why development of lightweight products usually requires compromise regarding mass, function, and cost.</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><strong>Introduction to the Lifecycle Assessment (LCA) method and standards</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Background of life cycle assessment considering Lightweight Design</td>
<td>describe what a lifecycle of a product is.</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>explain why the identification of the main environmental hot-spots is key to decrease overall environmental impacts</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Introduction to the LCA method and standards</td>
<td>explain what environmental impact assessment is and which environmental impacts can be addressed</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>name the phases of a LCA</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td><strong>The Lifecycle Assessment (LCA) framework</strong></td>
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<tr>
<td></td>
<td>explain the four phases in which a life cycle assessment is developed</td>
<td></td>
<td>x</td>
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<td></td>
<td>describe the benefits and boundaries of LCA</td>
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<td>x</td>
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<td></td>
<td>explain what a sensitivity analysis is</td>
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<td>x</td>
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<tr>
<td><strong>Life Cycle Costing (LCC)</strong></td>
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<tr>
<td>Life cycle assessment of lightweight materials and products</td>
<td>Explain which cost categories have to be considered in LCC</td>
<td></td>
<td>x</td>
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</tr>
<tr>
<td></td>
<td>Describe why the identification of the main cost drivers is key to decrease overall costs</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Requested competences (learning targets)</td>
<td>know</td>
<td>apply</td>
<td>evaluate</td>
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<tr>
<td><strong>Lightweight Design Strategies</strong></td>
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<tr>
<td>lightweight design by</td>
<td>explain the main strategies for lightweight design</td>
<td></td>
<td>x</td>
<td></td>
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<tr>
<td>- using materials of low density</td>
<td>name typical architectures found in lightweight structures</td>
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<td>x</td>
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<td>- optimizing component shapes</td>
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<td>- optimizing the overall design concept -</td>
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<td>- careful definition of requirements</td>
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<tr>
<td><strong>Multifunctional design</strong></td>
<td>explain the goal(s) of multifunctional design</td>
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<tr>
<td><strong>Interactions between</strong></td>
<td>name examples for typical interactions between design, material, manufacturing processes, and cost</td>
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<tr>
<td>material, manufacturing, and design.</td>
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<tr>
<td><strong>General view on development processes in the context of lightweight design</strong></td>
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<tr>
<td>Aspects related to lightweight design</td>
<td>explain the basic idea behind structuring the development process</td>
<td></td>
<td>x</td>
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<tr>
<td>which need to be considered</td>
<td>name the basic phases of the product development process</td>
<td></td>
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<tr>
<td>during product development</td>
<td>name the most important results for each phase of the product development process</td>
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<tr>
<td><strong>Product development process (PDP) according to VDI Guideline 2221</strong></td>
<td>explain the different phases of the product development process and their respective results</td>
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<tr>
<td>Schematic overview of PDP according to VDI</td>
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<tr>
<td><strong>Process phases</strong></td>
<td>explain the different phases of the product development process and their respective results</td>
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<td><strong>Introduction to materials for lightweight design</strong></td>
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<tr>
<td>Topic</td>
<td>Requested competences (learning targets)</td>
<td>know</td>
<td>apply</td>
<td>evaluate</td>
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<td>-----------------------------------------------------------</td>
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<td>Most important metallic materials for lightweight design</td>
<td>name the important classes of metallic materials for Lightweight Design</td>
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<td></td>
<td>explain the most important properties for the following materials: steel, aluminum, magnesium, powder materials and Cast iron (as compared to the other materials; i.e. „material class A tends to be relatively brittle compared to other materials“ etc.) (level: „use“)</td>
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<td>x</td>
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<tr>
<td>Most important non-metallic materials for lightweight design</td>
<td>name the important classes of non-metallic materials for Lightweight Design</td>
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<td></td>
<td>explain the most important properties for the following materials: Polymers, fiber reinforced plastics (as compared to the other materials; i.e. „material class A tends to be relatively brittle compared to other materials“ etc.)</td>
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<td>x</td>
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<tr>
<td>Introduction to manufacturing and assembly processes typically used for lightweight components</td>
<td>name important part manufacturing processes for each type of materials</td>
<td>x</td>
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<td></td>
<td>name assembly procedures typically used in lightweight structures</td>
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<td></td>
<td>explain at least one important part manufacturing process for each type of materials</td>
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<tr>
<td></td>
<td>explain at least three assembly procedures typically used in lightweight structures</td>
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<td>x</td>
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<tr>
<td>Qualification of workforce typically necessary for lightweight components</td>
<td>name typical safety issues with respect to production of lightweight structures</td>
<td>x</td>
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</tbody>
</table>
### Annex A: »CERTIFIED LIGHTWEIGHT PROFESSIONAL BASIC LEVEL«

<table>
<thead>
<tr>
<th>Topic</th>
<th>Requested competences (learning targets)</th>
<th>know</th>
<th>apply</th>
<th>evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Special skills (craftsmanship, simulation, electronics, chemistry, ...) -Health and safety -Regulatory requirements on formal qualification</td>
<td>name typical workforce qualification issues with respect to development/production of lightweight structures</td>
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<td></td>
<td>x</td>
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</tbody>
</table>

| Supply chain: Factors affecting material selection | name typical factors affecting material selection (e.g. technical (e.g. lightweight-indices), logistics (availability), regulatory (e.g. certification), economical (price of material; investment associated with suitable manufacturing processes), socio-economical (e.g. health & safety, environmental), marketing, Sources of information, Suggested order of consideration for above mentioned factors affecting material selection) |      |       | x        |
| Factors affecting material selection | name typical issues to consider with respect to the supply chain for the production of lightweight structures (e.g. technical (e.g. lightweight-indices), logistics (availability), regulatory (e.g. certification), economical (price of material; investment associated with suitable manufacturing processes), socio-economical (e.g. health & safety, environmental), marketing, Sources of information, Suggested order of consideration for above mentioned factors affecting material selection) |      |       | x        |
ANNEX B: »CERTIFIED LIGHTWEIGHT PROFESSIONAL ADVANCED LEVEL«

This certification profile is to be developed within 2019/2020.
ANNEX C: »CERTIFIED LIGHTWEIGHT PROFESSIONAL EXPERT LEVEL«

This certification profile is to be developed within 2019/2020.