BACHELOR & MEISTER

Designing and implementing a dual Bachelor's degree course with integral attainment of a Bachelor's and Master's degree (Bachelor's & Meister)

PRODUCT O1

BLUEPRINTS MODELS & CONCEPTS FOR INTEGRAL, DUAL COURSES OF STUDY

PARTNERS

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Blueprints Models & concepts for integral, dual courses of study

Content

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1. Summary of the Project

All EU countries face a rapidly growing shortage in leading personnel that significantly restricts growth of SMEs. The Hanse Parlament has comprehensively analysed the demand for young leaders and the necessary competencies for all countries of the Baltic Sea Region.

In some EU countries, e.g. in Germany, a high proportion of young entrepreneurs' regard vocational training as an attractive form, in particular, vocational master craftsman education (German *Meister*). Yet, there are challenges on the horizon.

In many EU countries, vocational training has lost much of its attractiveness; more and more young people are aspiring for an academic degree. Master craftsman training is perceived as a dead end and as a worse alternative to higher education.

In Germany, the master craftsman qualification is just like the Bachelor's degree at the level 6 in the German Qualification Framework. However, this does not have any practical effect and the actual permeability remains low. As a rule, already acquired competences in master craftsman qualification are not recognised for a study program.

Internationally, the master craftsman qualification is accredited only to a very limited extent.

Master craftsmen have extensive practical knowledge, professional experience, as well as good competences in practice and theory. On the other hand, competences in business management and company management are insufficient to run a business.

For SMEs, practical experience and professional knowledge are indispensable assets. Since many university graduates lack these competences, SMEs can only recruit few graduates from this pool. Therefore, relevant practical and theoretical competences, and professional knowledge shall be organised as study courses.

The project is to develop dual Bachelor's study courses, awarding two degrees: academic Bachelor's degree and vocational master craftsman qualification, and thus, pursuing the following goals:

- increasing relevance and quality and improving competencies and knowledge in the master craftsman training program and in the Bachelor's degree program,
- transfer of relevant professional skills and practical experience in a dual study approach,
- delivering significant contribution to overcoming shortage in SMEs entrepreneurs,
- introducing a Bologna-compliant study program, full international recognition
- contributing to the EU agenda on modernisation of Europe´s higher education systems,
- increasing the attractiveness of vocational education and training,
- creating permeability and reduce obstacles to qualification recognition.

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The project is carried out by six experienced partners from Germany, Poland, Lithuania and Finland. The internationally active lead partner is particularly experienced in training and support of SMEs, as well as in the implementation of complex projects.
A chamber is to join the project, contributing experience in master craftsman training and representing the interests of SMEs. Four partners are universities, one of which is highly experienced in conducting dual courses and in cooperating with SMEs.

The project is planned with a three-year implementation period, in which nine work packages, including the following main activities, will be implemented:

1. Project management and implementation of six workshops and two international consulting and transfer conferences.
2. Development of alternative methods and models for the accomplishment of dual study courses with integral achievement of master craftsman and Bachelor's degrees.
3. Development and coordination of four national implementation concepts.
4. Regarding building professions and -
5. Regarding electrical professions: designing curricula and module manuals for two integral dual courses, according to the guidelines and structure requirements for accreditation of Bachelor's courses.
6. Testing and implementation of the study course for construction professions.
7. Developing and coordination of examination regulations.
8. Introduction of further accreditations and preparation of further implementations.
9. Transfer of the project results to 68 chambers and universities from 13 countries participating as project partners in the project implementation by delivering sustainable implementation advice, as well as by implementation of further dissemination activities. All project results, such as concepts, curricula, etc. are internationally oriented for use in four European countries. Transfer and implementation in further countries will be actively encouraged.

Five products of the project:

- blueprint models and concepts for integral, dual study courses,
- module manual for the study course on Construction,
- module manual for the study course on Electrical Engineering,
- integral examination regulations for master craftsman qualification and Bachelor's degrees,
- handbook containing all project results, facilitating broad dissemination.

Broad and sustainable use will be ensured by means of a process-oriented expansion of the implementation across regions, e.g. by means of finance solutions.

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2. Challenges and tasks

Within the project "Common Vocational Training to Master in the Baltic Sea Region" of the Hanse Parlament, the goal was to deliver a high-quality vocational training to become master craftsman in the form of a Bachelor's degree program, including, among others, following positive outcomes:

- In Germany, the highquality master craftsman training and the Bachelor's degree are classified on the level 6 "Bachelor's and other comparable education and competences" in the German Qualification Framework, and thus are treated as equivalent qualifications. Yet, with hardly any practical effects.
- In Germany, after examination, graduates from master craftsman training courses are, as a rule, not granted general access to higher education. As a rule, if such graduates take up a university study, the acquired competences, knowledge etc. are not recognised.
- Implementation of a master craftsman training in the form of a Bachelor's program could eliminate obstacles, allowing for full permeability, and strengthening the significance of vocational training, this increasing its attractiveness.
- Automatic full international recognition - an issue controversially debated in the context of the existing master craftsman training.
- Like any other course, this form of the master craftsman training would also enjoy public support and recognition.
- Master craftsman trainings in the form of Bachelor's courses are already occasionally practiced in Germany and partly in some EU countries.
- Arranging uniform course duration of such Bachelor's courses for all occupations, including required occupation-specific contents.
- Transfer of already acquired competences, knowledge etc. would be easier, leading to shortage in study time.

All EU countries face a distinct, rapidly increasing lack in management staff which limits further development, most of all, of SMEs. The need for new personnel and for necessary competences across all Baltic Sea Region countries is high on the agenda and subject of comprehensive analyses of the Hanse Parlament.
In some EU countries, e.g. in Germany, a high portion of new personnel have vocational training background, especially master craftsman training. Yet, new challenges related to this form of education are looming on the horizon.

- In many EU countries, vocational training has become less attractive, more and more young people prefer a university study. In Germany, for the first time ever, in 2016 the number of students entering universities exceeded the number of vocational training contracts.
- Master craftsman training is increasingly regarded as a dead-end career path and as a worse alternative to higher education.
- In Germany, the master craftsman training is classified as the Bachelor's study course on the level 6 in the German Qualification Framework. Yet, hardly any

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practical consequences are related thereto, and the actual permeability is restricted.
- Whereas higher education qualification is associated with a master craftsman training already acquired competences are, as a rule, not credited for study courses.
- At the international level, a master craftsman degree gets only limited recognition.
- Master craftsmen possess comprehensive practical knowledge, professional experience as well as good competences in professional practice and theory.
- However, competences in business administration and business management for running a business are worsening, but highly needed improvements are not implemented, because many trades keep independent professional activity tied to a master craftsman training, with no prospect of changing this situation in near time future.

In SMEs, practical experience and vocational knowledge are essential for autonomous business activity. As many university graduates lack such competences, SMEs can recruit from this pool only a limited number of candidates to task them with managerial functions. This challenge can be overcome by delivering relevant competences in professional practice, theory and vocational knowledge in the form of courses.
This project will develop and implement dual Bachelor's courses offering an integral Bachelor's and master craftsman degree. The following are related activities to achieve these goals:
a) attainment of critically required improvements in competence and knowledge in a master craftsman training and in a Bachelor's study course.
- The master craftsman training has proved to be successful; however, competences and skills acquired thereby have become insufficient for entrepreneurial activity, especially with regard to business administration and business management. Therefore, it is critical to raise the qualification level of the master craftsman training in order to attain the necessary requirements as entrepreneur.
- Conventional courses lack professional competences and practical experience. Accordingly, quality, relevant knowledge and students´ skills shall be raised.

b) provision of relevant professional skills and practical experience by a dual study approach.
c) implementation of relevant content to overcome lack in new entrepreneurs for SMEs.
d) full international recognition as a Bologna-conform study model.
e) contribution to the EU Agenda on the modernisation of the European system of higher education.
f) raising attractiveness of vocational training and increasing acquisition of school-leavers with higher education qualification for vocational training.

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g) increasing permeability by overcoming barriers related to the crediting of acquired competences.

So far, vocational training under master craftsman and Bachelor's courses run completely independent of each other. Permeability and recognition of already obtained competences were limited and had practically hardly any relevance. Thus, dual courses are now developed in a completely new form and, for the first time ever, they will be implemented under this project. They will ensure integral attainment of Bachelor's and master craftsman degrees, thus, promoting an innovative approach to entrepreneurship and increasing the number of young entrepreneurs and managerial staff for SMEs, while raising the attractiveness of vocational education.
A novel idea is to combine the advantages of a master craftsman training with the advantages of a Bachelor's training, thereby eliminating the existing qualification deficiencies in both fields of education. For the first time, a course was designed aimed at specific qualification requirements of the managerial staff of SMEs, by focussing on critically relevant content and the quality of competences, skills and knowledge acquired, while, at the same time, eliminating so far existing problems regarding permeability, crediting of already acquired competences and international recognition of the master craftsman degree. Under the four-year course model, this innovative approach towards education will enable a growing share of young people with higher education qualification to acquire an apprentice, journeyman, master craftsman and Bachelor's degrees.
Another novelty is the consolidation of knowledge and experience in the Bachelor's courses as well as further training to master craftsman in four countries, as well as implementation of new, mutually recognised, international Bachelor's courses. Especially innovative is the linking of vocational advanced training and training under deepened cooperation between colleges/universities, chambers of commerce and SMEs.

Currently, the project "Common Vocational Training to Master in the Baltic Sea Region - Master BSR"[1] is being implemented by partners from Germany, Denmark, Poland, Lithuania and Latvia. In the participating countries of the Baltic Sea Region, uniform curricula were developed and implemented under a comprehensive vocational advanced training, to be completed with a "Master craftsman" degree (German *Meister*). The present project comprises results and experience from the current project "Master BSR", and constitutes a definitely more innovative approach, combining a uniform vocational advanced training and a study course for the Baltic Sea Region, and by achieving the goal of attaining an integral master craftsman qualification and Bachelor's degree.

Below, please find in the

[1] Hanse Parlament, Common Vocational Training to Master in the Baltic Sea Region (Master BSR), Scientific Series of the Baltic Sea Academy, Hamburg 2018.

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- Chapter 3, a brief abstract on the current status of permeability between vocational and academic education.
- Chapter 4, a description of alternative models and methods to effectively implement a professional master craftsman training as a Bachelor's degree program.
- Chapter 5, an approach to integrated teaching of master craftsman qualification and Bachelor's degrees as a base model.
- Chapter 6, a presentation of alternative options to realising initial vocational training and pursuit of professional activities, both constituting prerequisites for admission to the master craftsman examination.
- Chapter 7, two draft models subject to implementation under this project.
- Chapter 8, two implementation concepts for dual study programmes in Germany and Lithuania and analysis of the possibilities for implementation in Poland and Finland.

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3. Current situation related to permeability of vocational and academic systems

While in the past decades, especially in Germany, but also in other European countries (e. g. Austria, Switzerland), a clear distinction sustained between the profile of vocational versus academic education and qualification[2], meanwhile, such distinction has become blurred.

With the increase of the number of Bachelor's courses since the beginning of Bologna reforms in 1999 along with their professional differentiation and specialisation, today many courses have acquired strong professionally utilisable components to address the needs of the economy.[3] However, in the field of vocational advanced training, demands to be met by participants of, e. g. master craftsman or state-certified technician courses, have become more strict due to constant changes in technologies and techniques, provided that they were not already consistently rigorous. Overlaps in specific training and qualification systems are due to the reality of professional requirements to be met in a particular line of trade (by a master craftsman, technician etc.), which have become ever more and more difficult to distinguish from requirements set in Bachelor's courses.

Under specific, rather technically oriented qualification pathways (vocational vs. academic), it is often required to perform a comprehensive and profound problem analysis, based on practical experience and with recourse to valid measurement results obtained with approved tools, methods and methodologies, and subsequently to submit conclusive suggestions regarding the selected task solution, as well as to document the process in a due manner.
Therefore, it comes as no surprise that the issue of equivalence of vocational and academic education and qualification pathways or degrees is becoming more and more relevant in those European countries, characterised by both, a differentiated academic

[2] professional training and further training = orientation at operating requirements of economy; academic training = orientation at scientific and research-oriented requirements of society

[3] Thanks to the Bologna-process especially further development of national higher education systems in Europe, the qualification of specialists for the labour market as well as of the junior scientific staff were taken into consideration. In this regard the increase of the so-called employability plays a special role. It means that university graduates can take up qualified employment based on scientific education (professional and interdisciplinary competences as well as qualifications related to the specific profession). (Source: https://www.bmbf.de/files/Bericht_der_Bundesregierung_zur_Umsetzung des_Bologna-Prozesses_2012-2015.pdf, p. 5)
In fact the higher education system thereby becomes closer exactly to the (at least) German vocational training system, because in § 1 paragraph 3 of the Vocational Training Act (BBiG) it is defined for the training that vocational training (…) has to convey required professional skills, knowledge and capabilities (occupational competence) within the framework of well-regulated courses in order to perform qualified professional activity in the changing working environment. Also, within the framework of further training in the field of skilled crafts, the orientation of the examination in crafts which are subject to authorization according to the criteria of employability and thereby the participation at the market or competition belongs to the cornerstones of the vocational training system. In § 45 paragraph 2 of the Trade and Crafts Code it is determined that "thanks to the master´s examination it has to be determined, if the examinee is qualified to exercise a craft which is subject to authorisation and to perform independently as well as properly train the apprentices.

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and a professional education and qualification system (e.g. Germany, Austria, Switzerland). Owing to that aspect, with regard to the national qualification system, a crucial milestone would be the introduction of a tool to define specific vocational/academic education and qualification levels, subject to equivalent recognition. After a process of intense verification and application of the German Qualifications Framework (German *DQR*) criteria, the vocational qualification master craftsman (German *Meister*) was qualified as equivalent (not: similar) with the academic Bachelor's degree.

However, in everyday life, due to diverse national legal provisions related to higher and vocational education, this basic characterisation of equivalence has hardly any particular consequences for the holders of respective vocational or academic degrees. A master craftsman may neither call himself "Bachelor's" only because he has obtained a master craftsman qualification, nor will under the current DQR such fundamental equivalence of degrees allows the title holder for a simplified access to master craftsman courses.

On the other hand, holders of Bachelor's degrees may not necessarily call themselves Master Craftsmen, even if they might have acquired an academic Bachelor's degree in the respective professional field.
It is very unlikely that the fundamental legal barriers will be removed in the foreseeable future and that a genuine applicability of equivalence will be established in everyday practice by full recognition of degrees in each of both corresponding systems.

As there is no full legal separation of various vocational and academic educational and qualification pathways, possibilities of migration of performance results from one system into the other still exist.

Accordingly, basically it is possible to achieve (at least) partial usability of achievements in a study course that can meet certain requirements of the vocational training system (master craftsman examination), and finally to graduate from both training and qualification pathways, and to use respective legally sound qualification titles (Bachelor and master craftsman), but for the price of unplannable and mounting formal obstacles. On the other hand, at least partial recognition of vocational and advanced training qualification for a university study course, for those candidates who wish to subsequently obtain a university degree, is also practically possible under a streamlined model, using actual vocational degrees.

Both options are presented and duly analysed below.

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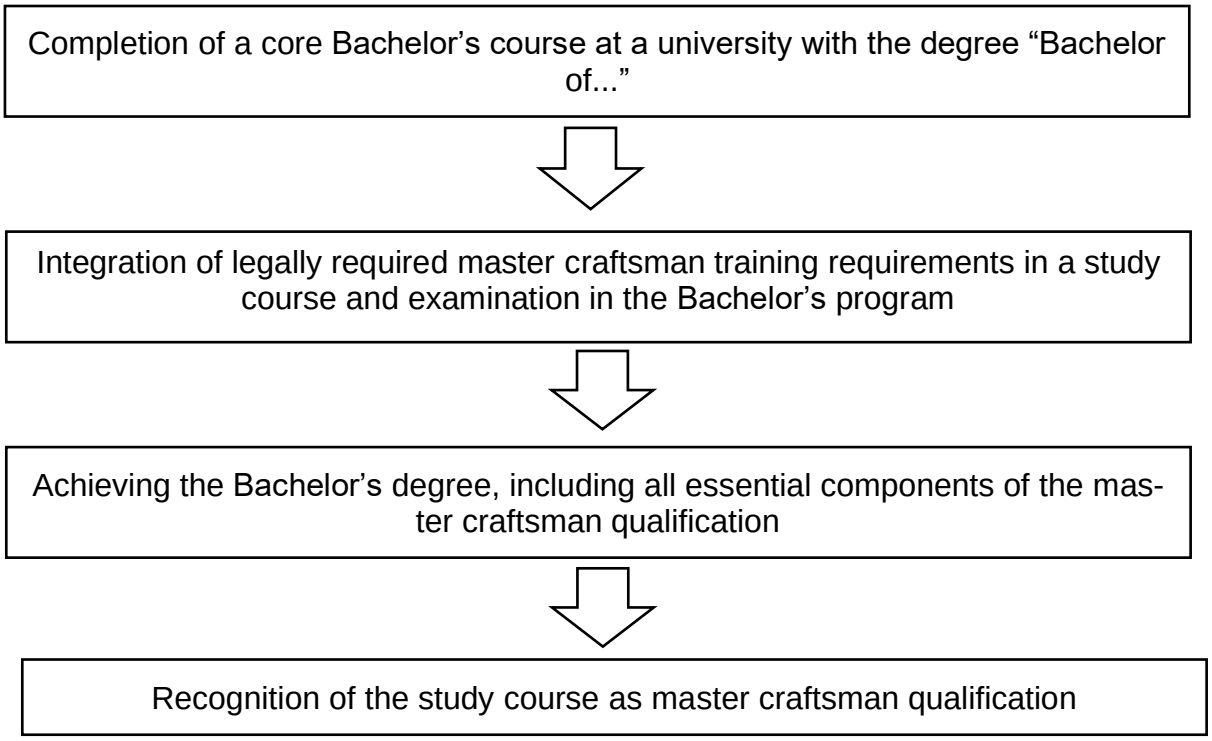
4. Options for usability of performance results obtained in the educational system

4.1 Recognition of academic achievements for the master craftsman examination parts

Upon successful completion of an academic study, according to respective provisions in the German Crafts Code, graduates can be exempt in a subject related to an accredited craft profession from one of the four parts of the master craftsman examination, if these examinations meet at least similar requirements as the master craftsman examination (see Art. 46 paragraph 2).

Overview 1: Upon a training to become also master craftsman



Peculiarities and challenges:

An examination board of a competent vocational training organisation (as a rule a craft chamber) determines compliance with due requirements. As this is carried out only upon completion of the study course, there is almost no planning certainty, predictability or "guarantee" with respect to the proof of compliance with the respective requirements of the study course for the master craftsman examination. Moreover, it is hardly possible that a Bachelor's course, designed for the achievement of an academic degree, might comprehensively meet the full scope of a master craftsman examination.

In practice, it is all about identifying similar requirements regarding individual parts of the master craftsman examination, and never about a full recognition of the entire

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course, i.e. of all parts of the master craftsman examination. The missing parts of the master craftsman examination are thus still pending and shall be completed accordingly with due amount of effort.

Conclusion:
It was observed that the above presented procedure bears significant risks as to the scope of actual recognition of the course contents. Furthermore, as a rule, individual parts of the master craftsman examination are not covered in the course, so that interested candidates with partial recognition of their master craftsman degree may face additional obstacles in terms of time, organisational and financial burden.

Eventually, randomly intermeshing vocational and academic qualification would not necessarily add to attractiveness of such educational and qualification pathway. Despite basic available transparency related to the presented possibility of recognition of studies for the master craftsman examination, this procedure does not represent a good example for establishing thorough equivalence of vocational and academic pathways and degrees.

In all probability, the above-mentioned procedure for achieving actual equivalence by integrating into the existing structures and legal provisions of the (already available) course may refer to the master craftsman examination requirements that are relevant for such examination. Acquiring a regular Bachelor's degree could constitute an evidence of meting all requirements of the master craftsman examination. Such evidence could be fully recognised by the respective master craftsman examination board so as to additionally award the title "master craftsman".

However, it should be critically mentioned that such integration of master craftsman examination requirements into existing structures of a study course, which is subject to higher education laws, may have hardly any realistic chances for success. Subsequent changes in the study course may be generally regarded as fruitless and hardly feasible.

Another possibility to at least partially credit vocational qualification of the training or of an advanced training for a study course, to gain a better scope of equivalence, is presented below.

4.2 Recognition of master craftsman qualification for parts of an academic study

This option is based on crediting of knowledge and skills acquired outside of the academic system by persons with vocational qualification, interested in taking up a

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university study. Institutions of higher education[4] maintain various options to credit knowledge and skills, acquired by vocational training or advanced training, i.e. master craftsman examination or during professional practice. Duration of studies may be reduced by crediting performance results of candidates with vocational qualification who are interested in a study course, thus lowering a major obstacle for taking up of a study course by the respective focus group with vocational qualifications.

In Germany, such recognition of educational background, including non-formal and informal learning, required by the European education ministers under the framework of the Bologna-process, was made obligatorily for institutions of higher education under respective decisions of the Conference of Ministers of Education and Cultural Affairs[5]. According to the results of this Conference, crediting of performance results can be achieved in the following manner:

1. Individual examination on a case-by-case approach. Based on documents provided by the vocationally qualified applicant it is examined, if and to which extent qualifications acquired in an institution other than higher education are equivalent in contents and in level with respective elements of the study course. Upon a case-by-case identification of equivalence, in accordance with the examination framework, such evidenced qualifications may substitute equivalent study course results and examinations.

2. General crediting. Certain vocational qualifications that, as a rule, were in advance determined by a higher education institution as equivalent in contents and level, receive recognition for a homogenous group of applicants (e.g. graduates from a master craftsman examination) without any further verification of each individual case.

3. Placement examination. Individual knowledge and skills of the vocationally qualified applicant are verified in a formal examination procedure for the purpose of eliciting the candidate to a high education study.

The Conference of Ministers of Education and Cultural Affairs leaves limited credit options to 50% of the scope of higher education studies.

Overview 2: Master craftsman becoming Bachelor:

Completion of a master craftsman course at the university, e.g. in crafts

[4] Also, further in the text the term "Institution of higher education" is used as a generic term for institutions of the tertiary education sphere, including universities, universities of applied sciences, technical colleges etc.
[5] Cf. decisions of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education I (dated 28.06.2002) and II (dated 18.09.2008)

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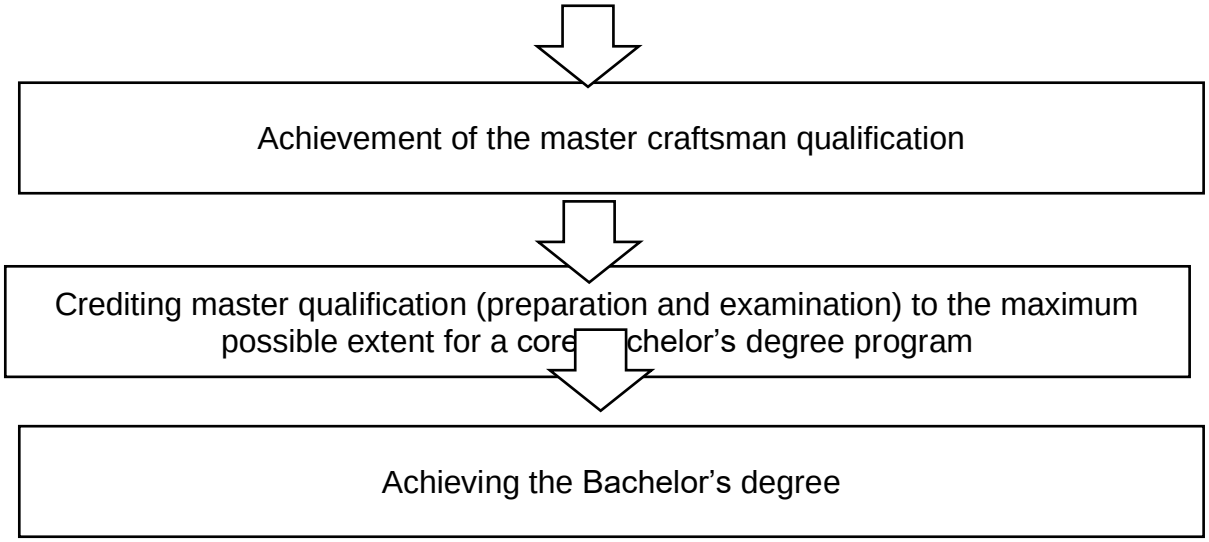

Characteristics / challenges:

Regulation related to crediting of knowledge and skills of candidates with vocational qualifications, such as performance results of studies and examinations, is basically reasonable and, based on a theoretically achievable credit share of 50%, it may contribute to a reduction in study time and to the politically desired facilitating transfer of persons with vocational qualification to higher education.

Crediting practice of higher education institutions reveals that the crediting scope, which potentially would mean a significant reduction of the study load and could create incentives for taking up a study, is not a common practice. The decision of the Conference of Ministers of Education and Cultural Affairs from 2008 has generally concluded that higher education institution may autonomously decide, whether and in which extent crediting of knowledge and skills, acquired at education institutions other than higher education, may be achieved. It is explicitly pointed out that such decision taken by the respective university [can]not be substituted ".. on grounds of diverse content-related possibilities regarding course design, [...], on the one hand, and on grounds of the variety of possibilities regarding professional and advanced training, on the other hand […]".[6]

Notably, for reasons of vocational and academic qualification diversity, considerable problems are related to the verification of vocational qualification with respect to the contents and level of equivalence. Equivalence of vocational qualifications often remains undetermined, and this happens only because, as a rule, the number of course hours attended under a formal vocational qualification measure is lower than the workload[7] of courses evaluated under the ECTS framework. Hence, knowledge and skills acquired in an informal manner in a specific field and in a professional environment are

[6] Cf. decision of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education II (dated 18.09.2008), p. 3

[7] Workload = amount of work for studies in a classroom and self-study

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completely ignored. Moreover, as a rule, in the curricula of vocational qualification measures, only the number of classroom-based events (class hours) is clear, but not the time for "self-study periods", which are, however, entered as "self-study" in the estimation of the workload of academic courses.

Further difficulties may be related to the verification of equivalence with regard to levels. Due to diverse goals assigned to vocational qualification measures and to academic courses, comparison proves problematic. Whereas vocational qualification measures are, first of all, aimed at transferring professional competences, in case of academic courses, science-oriented goals are paramount. Under the German Qualifications Framework (DQR) a tool is available for the determination of equivalence, at least with respect to formally recognised vocational qualifications. For example, master craftsman qualification is assigned to the same level as the Bachelor's degree. However, vocationally qualified applicants are not entitled to crediting of their qualifications. Irrespective of the rating in the DQR, in the verification process, higher education institutions can conclude that given qualifications are indeed not equivalent. Therefore, the DQR remains without direct influence on the crediting practice of higher education institutions.

Apart from problems related to verification of equivalence, due to structural diversity, substantial reservations were observed by several university representatives about recognition of equivalence, which may lead to adopting, in the verification practice, especially harsh formal verification criteria with regard to content, time scope and levels.

4.3 Generalised crediting by cooperation with vocational education and further education institutions

The already cited above decisions of the Conference of Ministers of Education and Cultural Affairs oblige higher education institutions "… to make use of existing possibilities of crediting and to develop procedures and criteria for the crediting of knowledge and skills acquired outside of the sphere of higher education in the corresponding examination regulations".[8] The Conference of Ministers of Education and Cultural Affairs recommends to institutions of higher education to embark on cooperation with proper training and further training institutions in a case-by-case approach, in order to reduce the examination-related workload, and to enable generalised crediting for homogenous applicant groups.

One example of such cooperation is the collaboration between the University of Applied Sciences for SMEs (FHM) with the Cologne Chamber of Crafts. The development of the study course "B. Sc. Industrial Engineer" was a collective success, based on full

[8] Cf. decision of the Conference of Ministers of Education and Cultural Affairs concerning the crediting of knowledge and skills acquired outside of the sphere of higher education in the higher education II (dated 18.09.2008), p. 3

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crediting of the master craftsman training, conducted by the Chamber of Crafts. The course was "… conceived with the provision that competences transferred during the master craftsman training shall correspond with competences provided in the Bachelor's course of FHM, thus safeguarding full equivalence during the study term".[9] Thus, the allowable recognition rate of 50% was used in full and the study term was reduced from 18 terms to 9 terms.[10]

University representatives agreed that with respect to transfer of science-based fundamentals, vocational qualification measures were sufficient.[11]
Both characterised basic possibilities of using previously acquired results of one educational and qualification system for recognition in the corresponding system, and the outlined mounting challenges related thereto in achieving actual equivalence of vocational and academic degrees and qualifications, lead to the conclusion that it is more rational to design a Bachelor's course in a way that it will integrate both, the very much required science-oriented fundamentals and necessary competences of a master craftsman's qualification. This pathway will be outlined in the presented below option three.

[9] Expert report related to the decision of the FIBAA accreditation board for programs concerning the accreditation of the course Industrial Engineer (B. Sc.) dated 27./28.9.2012, p. 13
[10] Cf. Homepage of FHM, http://www.fh-mittelstand.de/wirtschaftsingenieur/
[11] So, in the expert report related to the initial accreditation of the course "B. Sc. Industrial Engineer" of FHM it is criticized: "Especially concerning the part of the course related to engineering sciences experts missed various basic subjects. So, experts missed, for example, the following technical subjects: Fundamentals of Mechanics, Fluid Mechanics, Thermodynamics and Chemistry on the level of engineering sciences. The fundamentals resulting from the master craftsman training are oriented at crafts. The module provided in the FHM "Natural and engineering fundamentals I and II" is not sufficient in the opinion of experts for the conveyance of required fundamental knowledge of an engineer. (Expert report related to the decision of the FIBAA accreditation board for programs concerning the accreditation of the course Industrial Engineer (B. Sc.) dated 27./28.9.2012, p. 28

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5. Integral design of the master craftsman training and Bachelor's study course under the study framework

Based on the presented procedure related to achieving equivalence, and given the outlined challenges and difficulties, please find below a third option to establish a master craftsman and a Bachelor's degree.

The central objective of the project idea outlined here was to design an educational and qualification system, with the master craftsman qualification and the Bachelor's course being integral elements of a common system. To this end, first of all, all relevant legal provisions and framework conditions for obtaining corresponding degrees are to be identified and considered in the design of a common educational and qualification pathway.

Besides legal provisions, the design of such third option – a Bachelor's course with integral master craftsman qualification – includes various institutional, organisational, curricular, personal and, if required, any further model parameters, summarised in the table below, including respective examples.

Overview 3: Design parameters for an integral vocational and academic educational and qualification system

Core design parameters of the system	**Verification of necessity and suitability of...**
Institutional and physical equipment for courses and examinations	Seminar rooms, laboratories, technical rooms, libraries, examination rooms...
Sufficient number of personnel incl. lecturers and examiners	Qualifications, experience, ideas about equipment and staffing incl. full-time and part-time lecturers and examiners
Sufficient number of personnel incl. employees for organisation, management and administration	Qualifications and experience
Curricular and content requirements	(Framework) course concepts, module handbooks, minimum number of hours for modules, courses and examinations, examination requirements and tasks (written, oral, practical...)
Institutional and legal requirements	Implementing course and examination organisations, e. g. chambers, universities, educational institutions… Legal provisions for vocational and academic education pathways, e. g. admission regulations, course and examination regulations...
Practical requirements	Cooperation and practice partners, e. g. enterprises for the acquisition of practical experiences...
Other requirements	...

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The third pathway contains three central areas of responsibility concerning the establishment of an integral system, briefly outlined below.

Area of responsibility A

In a first step – all existing and available legal and curricular framework conditions (as a rule – laws and regulations) in order to identify (minimum) requirements for the master craftsman examination and for a subject-specific comparable Bachelor's course, subject to survey and analysis.

Notably, the main focus of the analysis being the corresponding admission provisions, scope and term of the study course (minimum workload), main topics, types and scope of examinations, requirements and scope of final examinations, as well as further specific requirements, if any, to be taken into account in establishing an integrated system.

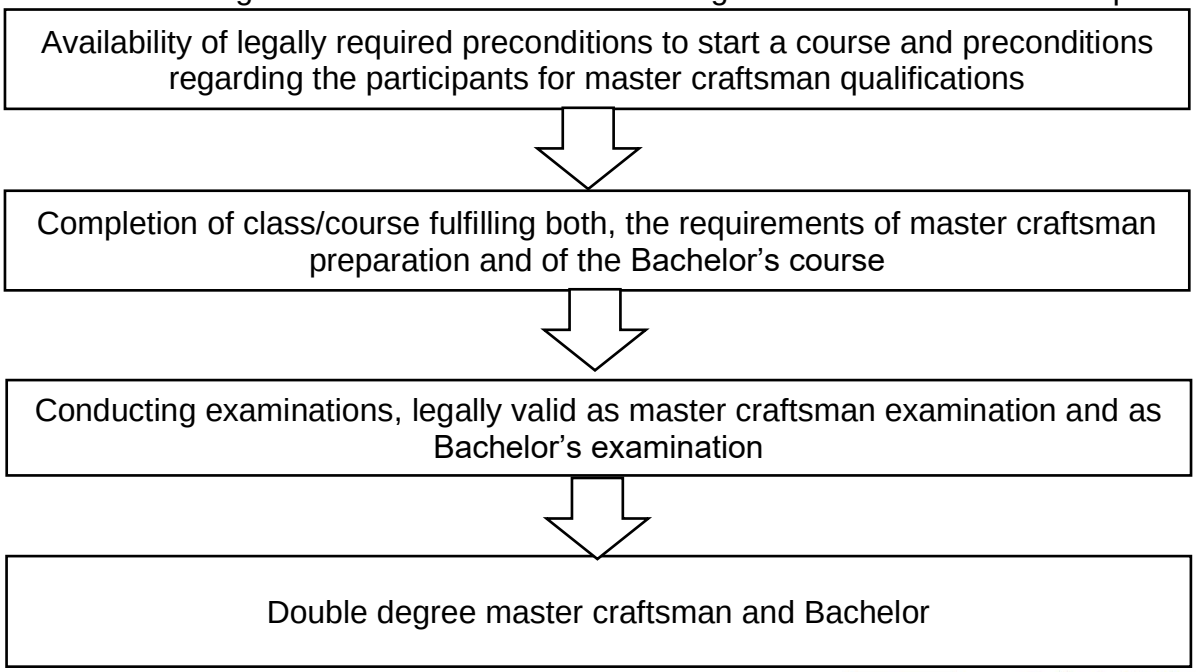
Area of responsibility B

In accordance with the survey and analysis, a synopsis (comparison) is to be drafted, concerning all relevant legal provisions and regulations, curricular benchmark figures, with respect to inherent differences and similarities, as well as any "open issues". Finally, matching or non-matching of relevant legal and curricular framework conditions will be presented, along with a ready determined scope of substantial organisational areas.

Area of responsibility C

Presentation on a specific example of a drafted "blueprint" for organising a Bachelor's course, including integrated master craftsman qualification aspects, based on all required legal and curricular framework conditions and organisational areas.

Overview 4: Integral attainment of a Bachelor's degree and master craftsman qualifi-



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6. Alternative options for achieving vocational training and activities

The prerequisite for admission to the master examination in all Baltic Sea Region countries with regulated master training is a successful completion of vocational training in the relevant or related profession. In addition, in some Baltic Sea Region countries, several years of professional activity following successful completion of vocational training is a prerequisite for admission to the master craftsman examination. Against this background, the question arises, as to how these conditions shall be fulfilled in a Bachelor's degree course with integrated master craftsman training.

6.1 Vocational Training

To begin with, it is plausible to develop a training program that integrates initial vocational training, master craftsman training and a Bachelor's study course with respective three recognised educational qualifications/diplomas/degrees. In Germany, occasionally such pathway is chosen as a so-called "three-way study pathway". In fact, this is not an integrated training program, but rather single parts of the training are completed one after the other. Integration of all three training courses under dual Bachelor's programs is an excessive demand for the participants.

If all three training courses were integrated in a dual Bachelor's study program, with a study term of about four years, participants would have to complete:

a) dual vocational training, in a company and in a vocational school, usually lasting 3 to 3,5 years, including the option of reduction by about one year, if the participant has a high school degree and can evidence particularly excellent educational achievements,
b) a master craftsman training, lasting in a full-time mode at least eight months, but for many professions longer than one year,
c) a complete Bachelor's degree program, usually lasting at least three years,
d) training and professional activities in a company, comprising at least 50% of the total training time for dual study programs, during the entire four-year qualification period.

Since integration of all three parts of a training program is unfeasible, there are four alternative pathways to complete a vocational training or to fulfil the conditions for admission to the master craftsman examination.

1. <u>Several years of professional activity or study</u>

With any vocational training at all, conditions for admission to the master craftsman examination are absolutely equally fulfilled:

a) in case of evidenced professional activity of at least five years in the relevant or in a related profession, or
b) upon completion of a Bachelor's study in a subject relevant to the respective profession of master craftsman training.

The dual Bachelor's degree program fulfils these admission requirements.

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2. Completion of vocational training prior to commencing a study

Prior to commencing a study, participants complete a dual vocational training course, which upon presentation of a middle school leaving certificate, high school diploma and good grades during vocational training, usually lasts two years. This path is especially recommended.
Successful completion of the journeyman or skilled worker exam, plus several years of professional experience also entitle candidates with no university qualification to admission to a subject-related study at a technical college (German *Fachhochschule*).

3. External journeyman or skilled worker examination

Participants without any formal vocational training can apply during their study as extraordinary applicants for admission to a journeyman or skilled worker examination[12]. The decision on admission is with the competent examining board or competent chamber.
If the required knowledge and skills were not part of the dual study course at the university or in the partnering company, they shall be acquired in self-study.
This approach involves some legal uncertainty for candidates, making it impossible to know in advance, whether they will get admission to a journeyman or skilled worker examination, and whether their knowledge and skills acquired are sufficient to pass the exam.

4. Admission to the master´s examination without any prior vocational training

One final option is the possibility of admission to the master craftsman examination without any prior professional training[13]. Decision regarding such exceptions is with the competent master craftsman examination board.
However, this pathway involves the legal uncertainty that it is not certain in advance, whether admission to the master´s examination will be granted. For dual study programs, chances for admission to the master's examination without prior vocational training are high due to the occupational activity and training in the partnering company during the study period.

For dual Bachelor's degree programs, the first option seems particularly appropriate. However, given the significance of vocational training and experience with regard to master craftsman training and subsequent employment in small and medium-sized enterprises, participants should also be recommended the second option, with prior vocational training. By contrast, option three and four should remain exceptions. However, the final decision is with participants, they shall decide for themselves. But in neither case, successful completion of vocational training shall constitute a condition for admission to a dual Bachelor's degree program with integrated master craftsman education.

[12] External Examination acc. § 45 German Law for Vocational Training and § 37 German Carts Code.
[13] See § 49 German Crafts Code.

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Under this project, option one and two are favoured, however the third and fourth pathway is basically not excluded.

6.2 Occupational activities following vocational training

In the past, in Germany, a three-year professional activity in a learned or related profession, following successful completion of vocational education, was a prerequisite for admission to the master craftsman examination. This condition was eliminated by the amendment to the Crafts Code. Now, admission to the master craftsman examination is granted immediately upon successful completion of the journeyman or skilled worker examination.

Some countries of the Baltic Sea Region with an officially recognised master craftsman qualification still follow the rule of demanding several years of professional experience as obligatory prerequisite for admission to the master craftsman examination. Following the vocational training period, two years must be evidenced in Norway, three years in Poland and three to four years of professional experience in Latvia. These conditions are sufficiently met under the dual study programs with a total of four years of professional activity.

In other countries with no regulated master craftsman training, examination regulations can be designed in a way to meet the requirements of dual Bachelor's programs with integrated master craftsman qualification. For example, under the project "Common Vocational Training to Master in the Baltic Sea Region (Master BSR)"[14], when introducing a master craftsman training in Lithuania, no professional experience was required upon completion of vocational training. Instead, relevant conditions for admission to the master craftsman examination were set as follows:

- successful completion of at least three years of vocational training in the respective or related profession. Evidence of occupational activity for shorter training periods, so that a total of at least three years can be evidenced, or
- at least five years of professional experience in the relevant or related profession, or
- Bachelor's study course in a specialisation related to the respective profession and a completed master craftsman training.

[14] Hanse Parlament: Common Vocational Training to Master in the Baltic Sea Region (Master BSR), Baltic Sea Academy, Hamburg 2018.

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7. Two basic models for a dual Bachelor's study course with attainment of a Bachelor's degree and a Master craftsman qualification

To test and gain experience with different professions, study fields and various integration models, and thus to better meet varying national conditions, in the project:

- two study courses with respective master craftsman training will be developed:
  a) a dual Bachelor's study course "Construction and Real Estate Management" with integrated master craftsman training in construction-related professions.
  b) a dual Bachelor's study course "Electric Engineering" with integrated master´s training in electrical occupations.
- two different integration models of Bachelor's and master craftsman education will be applied and tested:
  c) model A "Recognition of academic achievements in parts of the master craftsman's examination" (see chapter 4.1).
  d) model B "Integral attaintment of master craftsman training and Bachelor's degree under the study framework" (see Chapter 5).

In the project, model A will be used for the Bachelor's study course "Construction and Real Estate Management" and model B for the Bachelor's study course "Electrical Engineering". Implementation of such different combinations and models will consider varying national conditions, as well as experience and requests of the involved project partners.

7.1 Model A: Bachelor's study Course "Construction and Real Estate Management"

Dual study course

The entire study program comprises a total of seven semesters and is structured as a dual study program, based on regular switching between theory and practice in each semester. The 13-week theory phase consists of twelve weeks of classroom teaching, followed by a subsequent examination week. Teaching is consolidated into a condensed period, covering up to 30 teaching hours per week in certain study semesters. This approach allows for comparability with a 16-weeks semester, with about 24 weekly lecture hours per semester. The study course has a clearly structured form.

The practical phase seamlessly follows the theoretical phase, lasting 13 weeks. During practical phases, practical work is accomplished, in close collaboration between students, partnering companies and higher education institutions, drawing on teaching modules related to the respective preceding theoretical phase. The final practical phase of eight weeks is reserved for the preparation of a bachelor's thesis. The thesis shall refer content-wise to the student´s activities in the practice company.

During practical phases, parallel to the regular work hours spent in the practice company, students elaborate on problems of the practice company in form of a supervised

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practice-related work. The involved practice companies are in the construction, civil engineering industry, engineering and planning offices, construction departments of companies and municipalities. They conclude a regular contract with students, including stipulated remuneration details.
The courses offered during the theory phases are focused on the requirements of the prospective professional environment. With regard to preparation of students for their professional future tasks, the teaching program includes personal key qualifications, foreign languages and optional, but obligatory courses (German *Wahlpflichtfach*) in English. As a rule, each theory phase includes six subject modules. School presence varies between four and eight hours per week, depending on the size of the module.

Study course

The study course is focused on construction-related contents, i.e. the students of the study course "Construction and real estate management" are interdisciplinary engaged with students of regular civil engineering study courses in subjects like construction material practice, structural design or design of the real estate object.
Main emphasis is on project development, project management and facility management. Students are tasked with solving issues of comprehensively managing the entire life cycle of a real estate object, beginning with the initial concept and up to due administrative concepts. In this line, and often in close collaboration with partners from the building and real estate industry, students develop three real estate projects from different market segments.
Furthermore, especially in the practice-oriented four-semester "Business Administration" course, with emphasis on corporate management, marketing and monetary management, students get prepared for managerial duties in a company.
The course curriculum was designed for a standard duration of seven semesters and it has a modular structure. Each module constitutes a self-contained unit. Modular structuring allows for recognition of academic achievements at universities in Germany and Europe. Core modules, plus obligatory elective courses (German *Wahlpflichtfach*) enable early specialisations, while the involved companies are invited to co-determine course contents. Evaluation is based on Credit Points (CP), in accordance with the European Credit Transfer and Accumulation System (ECTS). The Bachelor's exam is rated with a maximum of 210 CP.

The Bachelor's degree entitles to a subsequent academic Master´s study programs.

Integration of the master craftsman training

Integration of preparations for the master craftsman examination is secured by the recognition of academic achievements in various parts of the master craftsman examination (see Chapter 4.1). In a break from tradition, recognition is not granted upon completion of the study course, but on the basis of the curriculum and theoretical and practical phases, but specifically for this study course – by the competent chamber and

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competent master´s examination committee. This provision was introduced in order to preserve legal certainty for the students.

The master craftsman exam consists of four parts:

- Part I: Occupation-related practical training, including the manufacture of a masterpiece
- Part II: Occupation-specific theory
- Part III: Business administration, law and management
- Part IV: Occupation-related and work-educational knowledge

The Bachelor's study program integrates all examination-relevant requirements of the master craftsman examination of parts I to III. The current examination regulations for the building professions no longer provide for executing a masterpiece in Part I[15].
The integrated study program does not prepare for it and, accordingly, no masterpiece is executed.
The obligatory elective module "Preparation for the training-qualification exam" in the integrated Bachelor's program prepares for Part IV of the master's exam, along with a separate trainer's qualification test, which is fully compliant with Part IV of the master's exam[16]. Accordingly, other Baltic Sea Region countries also have their training programs for trainers, including final exams[17].
This ensures that even before commencing the study course, the dual Bachelor's degree program entitles students to an integrated attainment of the Bachelor's and Master's degrees. Under this program, students can select either the Bachelor's degree only or, if they wish, they can additionally acquire also the Master's degree. For students who are seeking both degrees, the module "Preparation for the training-qualification exam" is obligatory.

Admission criteria

Prerequisites for admission to the study program are either a high school certificate or a technical vocational diploma or a university qualification. In addition, various vocational diplomas, sometimes in combination with practical professional experience, also entitle for admission to higher education. Different admission requirements are practiced in each Baltic Sea country, in particular, with regard to university admission based on vocational qualifications.

Vocational training and practical professional experience

Successful completion of a vocational training does not constitute a prerequisite for admission to a study course but is recommended to the students. Within the study period, students can also externally pass a journeyman or skilled worker exam (see

[15] "Regulation on Master Concrete Placer from Aug. 30 2004 (BGBl. I S. 2307), amanded by Art. 16 Regulation from Nov. 17 2011 (BGBl. I S. 2234)"
[16] Regulation on training qualifications, BGBl 2009, Part I nr 5
[17] Hanse Parlament: Qualification and integration of young peoble through dual vocational training, Scientific Series of the Baltic Sea Academy, vol. 24, Hamburg 2017

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Chapter 6.1, option three), though the study program does not specifically prepare for this option.
Admission conditions for the master's examination, with regard to vocational training and practical professional experience, are fulfilled thanks to the practical phases of the dual study program and thanks to the Bachelor's degree (see Chapter 6.1, option one; and Chapter 6.2).

Degrees
Credit Points (CP) are used for evaluation, in accordance with the European Credit Transfer and Accumulation System (ECTS). The Bachelor's exam is rated with a maximum of 210 CP. The practical phases account for half of each semester and are likewise awarded credit points. The topic of the Bachelor's thesis is co-determined by the involved companies and, as a scientifically supported project; it constitutes a considerable added value for the employers.

Students graduate with the title:

- Bachelor of Engineering (B. Eng.)
- Vocational Master Craftsman (German *Meistertitel, Meisterbrief*) or
- an engineering certificate of the competent chamber of engineers.

Accreditation
For the project, the dual degree program is a combination of existing and already accredited study and training courses, so that no further accreditation is required, and implementation can be initiated even during the project term. Any additional modules of the degree program may be included in the re-accreditation of study programs by the university.

7.2 Model B: Bachelor's study Course "Electric Engineering"

Dual study course
The entire study program comprises seven semesters and is structured as a dual study program with regular switching between theory and practice. Each semester contains a theoretical and a practical phase. The 13-week theoretical phase consists of twelve weeks of classroom teaching, followed by an examination week. Teaching is consolidated into a condensed period with up to 30 lessons per week in some study semesters. This form enables comparability with a semester, usually lasting 16 weeks with about 24 weekly lecture hours per semester. The study program has a clearly organised structure.
The practical 13-weeks phase seamlessly follows the theoretical phase. During the practical phases, practical assignments are accomplished, in close collaboration between students, involved companies and the university, drawing on specific teaching modules of the related preceding theoretical phase. The final practical phase is intended for the preparation of the Bachelor's thesis, which is to be written within a period

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of eight weeks and shall refer content-wise to the student´s activities in the involved practice company.
During practical phases, parallel to the regular work hours spent in the practice company, students elaborate on problems of the practice company in form of a supervised practice-related assignment. The involved companies conclude a regular contract with the students, including stipulated remuneration details.
The course contents in the theoretical phases is oriented at the requirements of the professional environment. In order to prepare the students for their professional future, personal key qualifications, foreign languages and optional, yet obligatory courses in English are key elements of the study concept. As a rule, each theoretical phase contains six subject modules.

Study course

The course curriculum was designed for a standard duration of seven semesters and has a modular structure. Each module constitutes a self-contained unit. Modular structuring allows for recognition of academic achievements at universities in Germany and Europe. Core modules, plus obligatory elective courses (German *Wahlpflichtfach*) enable early specialisations, while the involved companies are invited to co-determine course contents. Evaluation is based on Credit Points (CP), in accordance with the European Credit Transfer and Accumulation System (ECTS). The Bachelor's exam is rated with a maximum of 210 CP.

Under the common system, the dual degree program integrally prepares for the master craftsman examination and for the Bachelor's degree.

Educational objectives of the master craftsman training

The aim of the master craftsman training in the field of electrical engineering is to autonomously manage a company, to perform leadership tasks in areas of technology, business and personnel management and development, to carry out vocational training and autonomously implement professional competence schemes, while adapting to new requirements in these areas.
For all key tasks of the electrical engineering master craftsman training, competences for the following joint activities, knowledge and skills will be acquired under a comprehensive qualification program:

- Determining customer requirements, advising customers, calculating services and creating offers, negotiating contracts and setting order targets.
- Performing technical and commercial management tasks, company organisation, personnel planning and personnel deployment, in particular, taking into account company training and continued education, quality management, liability and occupational safety, work safety, data protection and environmental protection; Use of information systems.

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- Executing orders, taking into account system engineering, maintenance alternatives, topographical conditions, job-related laws, standards, rules and regulations, personnel requirements and training; organising, planning and monitoring order processing and order control.
- Creating documentation using computerised systems.
- Considering material properties during planning, construction and execution.
- Developing, planning, manufacturing, programming, parameterising, erecting and maintaining electrical equipment, taking into account health and safety-related precautionary measures; considering and applying techniques for rational use of energy.
- Applying measuring and testing techniques, assessing and documenting results.
- Designing contracts; Drafting and maintaining standard contracts, especially service contracts.
- Carrying out fault and troubleshooting, taking measures to eliminate faults and errors, evaluating and document results.
- Accepting and keeping records of services, passing them on to the customer, settling accounts and carrying out final costing.

Competences for the following specific activities, knowledge and skills under a comprehensive qualification program are to be acquired for each main task of the electrical engineering master craftsman training:

- Focusing on energy and building technology
  Planning, calculating, constructing, programming, parameterising, setting up and testing of systems and plant components for energy and building services engineering, in particular, for the generation, transmission, conversion and supply of electrical energy, earthing, lightning protection, surge protection and antenna systems, lighting, heating, cooling and air-conditioning systems, building automation, bus technology, signal transmission technology, techniques for the rational use of energy as well as their electrical and electronic operating resources.
- Focusing on communication and safety technology systems
  Planning, calculating, constructing, programming, parameterising, erecting, testing, commissioning and installing plant and system components for communications and security technology, in particular, telecommunications technology, electro-acoustics, data transmission and processing technology, telecontrol technology, call and signalling technology, alarm signalling technology, emergency warning system technology, video technology, hospital communications technology, access control technology and time management systems.
- Focusing on systems electronics, developing, designing, planning, calculating, constructing, programming, parameterising, erecting, testing and maintaining systems and plant components for systems electronics, in particular, for

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measurement, control and drive technology, testing and counting technology, medical and laboratory technology, as well as methods of systems and software integration.

Under this project, it is planned to design and to implement an integral Bachelor's and master craftsman study program in electrical engineering with the main focus on energy and building technology.

Educational objectives of the Bachelor's study program in electrical engineering: Key focus is on energy and building technologies

The objective of this study program is the training of highly qualified, practice-oriented and scientifically educated specialists and business leaders.

Energy and building technologies are of high social value. In the years to come, their importance will increase due to the significance of environmental issues. Both, the planning of new buildings and technical facilities, as well as rehabilitation and optimisation of existing buildings, require systems engineers, "tech professionals for the building envelope". In this context, "systems" refers to the provision of all required forms of energy and media for heating, air-conditioning and refrigeration systems, gas, sanitary and water systems, as well as to disposal of media and infrastructure.

Besides the need for increased efficiency and a rational use of energy, the use of new, alternative energy sources also has a significant role. Continued technological progress and use of modern, renewable energy technologies, such as solar thermal power, photovoltaics, geothermal energy, combined heat and power plants, heat recovery systems and heat pumps constitute determinants for required occupational fields related to planning and commissioning of power and media supply systems. The design objects range from single-family homes to large industrial plants. Key concerns relate, not only to the reduction of operating costs, but also the emissions avoidance and to increasing in the utilisation quality and comfort.

Graduates will find employment in areas, such as: power engineering, energy supply and technical building equipment. Besides, they will be welcome to embark on a variety of companies and offices, in particular:

- planning authorities/departments, planning/design offices
- manufacturers of heating boilers, solar energy systems, heat pumps etc.
- plant engineering companies
- utility companies and energy service companies
- leaders of crafts companies
- company managers
- regulatory bodies and technical control boards.

The Bachelor's degree entitles to a subsequent Master's degree.

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Integration of the master craftsman education

The master craftsman qualification and the Bachelor's degree program are integral parts of a common system (see Chapter 5.). The master craftsman exam consists of four parts:

- Part I: Occupation-related practical training, including the manufacture of a masterpiece
- Part II: Occupation-specific theory
- Part III: Business administration, law and management
- Part IV: Profession and profession-related educational knowledge

The design of the Bachelor's degree program with integral master´s qualification prepares students for all parts of the master's examination and fulfils all conditions of a Bachelor's study program. The final exam is structured as a single exam before a mixed examination board. Insofar as this is not possible, master´s examination shall take place directly upon completion of the Bachelor'sexamination.

Prerequisites

Prerequisites for admission are either a high school diploma or a vocational technical diploma or university qualification. Besides, various vocational qualifications, sometimes in combination with practical professional experience, facilitate access to higher education. Baltic Sea countries practice various admission requirements, in particular, with regard to admission based on vocational qualifications/degrees.

Vocational training vs. practical professional experience

Successful completion of a vocational training constitutes no prerequisite for admission to a study program but is recommended to students. During their study, students are entitled to externally pass journeyman or skilled worker exams (see Chapter 6.1, option three), though the study does not specifically prepare for this option.
Admission conditions for the master's examination, with regard to vocational training and practical professional experience, are fulfilled thanks to the practical phases of the dual study program and thanks to the Bachelor's degree (see Chapter 6.1, option one; and Chapter 6.2).

Degrees

Credit Points (CP) are used for evaluation, in accordance with the European Credit Transfer and Accumulation System (ECTS). The Bachelor's exam is rated with a maximum of 210 CP. The practical phases account for half of each semester and are likewise awarded credit points. The topic of the Bachelor's thesis is co-determined by the involved companies and, as a scientifically supported project; it constitutes a considerable added value for the employers.
Students graduate with the title:

- Bachelor of Engineering (B. Eng.) or Bachelor's of Science (B.Sc.).
- Master, Master Craftsman (German *Meistertitel, Meisterbrief*)

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Accreditation

The accreditation procedure will be initiated directly upon preparation of the module manual. Should it prove impossible to finish that process during the project term, proper accreditation will be definitely ensured after the project end date.

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8. Implementation concepts

The possibilities of the two models

- A: Bachelor's study Course "Construction and Real Estate Management"
- B: Bachelor's study Course "Electric Engineering"

were examined intensively in the two implementation countries Germany and Lithuania planned for the project duration as well as in the other countries participating in the project, Poland and Finland, and consulted with business chambers, universities, public administrations and other stakeholders.

8.1 Germany

8.11 Short analysis of the occupational field of construction and of legal requirements[18]

The building industry provides trade occupations requiring an apprenticeship and engineering professions typically requiring a degree in construction engineering.

Trades

There has been a negative trend in trade occupations in Germany since 2007. This is shown in particular by the level of trade apprenticeships and also by the numbers of successfully completed final examinations at the end of trade apprenticeships. Numbers have been declining here since 1998 (see Figure1.1).

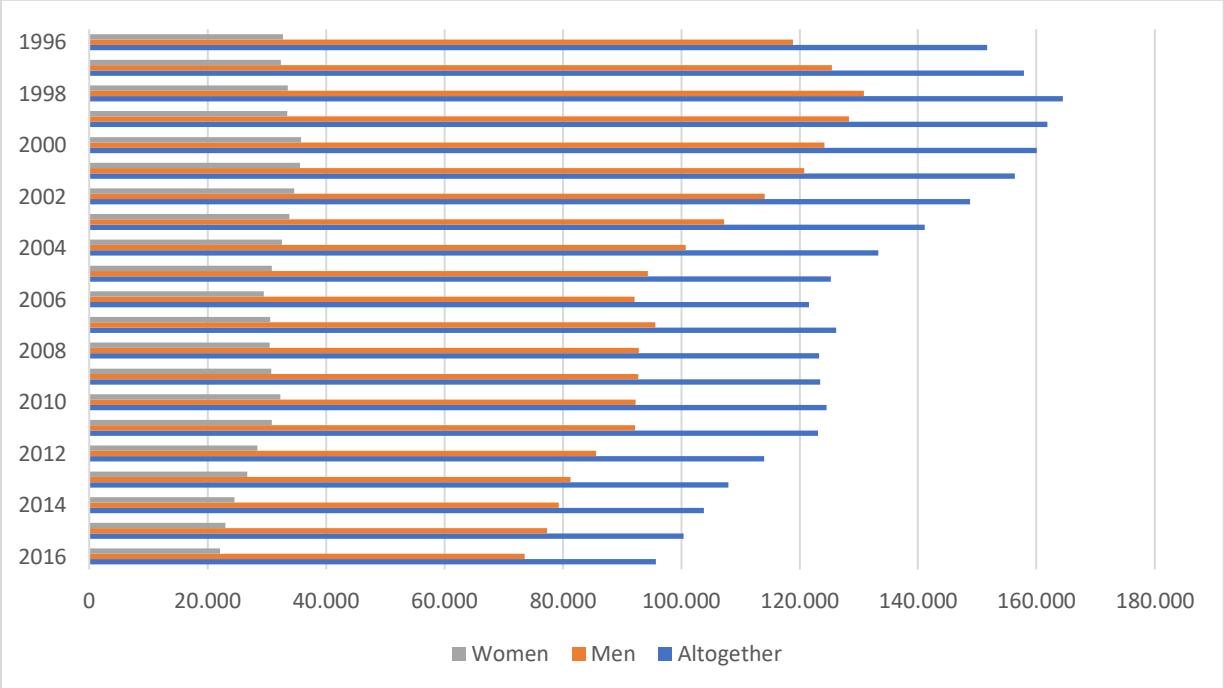

Figure1.1: Successfully completed final examinations for trade apprenticeships up to 2016[19]

[18] Prepared by the Project Partner Hochschule 21

[19] Statista, Bestandene Meisterprüfungen im deutschen Handwerk nach Ge-schlecht bis 2016, URL: https://de.statista.com/statistik/daten/studie/244558/umfrage/bestandene-meisterpruefungen-im-deutschen-handwerk-nach-geschlecht/ (28.02.2018)

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23.2% of positions for trainees as steel and concrete constructors remain vacant. This shows an alarming trend for the occupations requiring apprenticeships, with a decline of 36.9%, which clearly indicates how unattractive these are.

The development is even worse for the numbers of master's certificates awarded in Germany. As a consequence of the lower numbers of apprentices, there is also a clear drop in the numbers of new trade masters. Whereas in 1996 there were 40,783 new masters, by 2016 the number had fallen to 21,266 (Figure1.2). This represents a decline of 47.9%, which is even more drastic than for the completed apprenticeships.

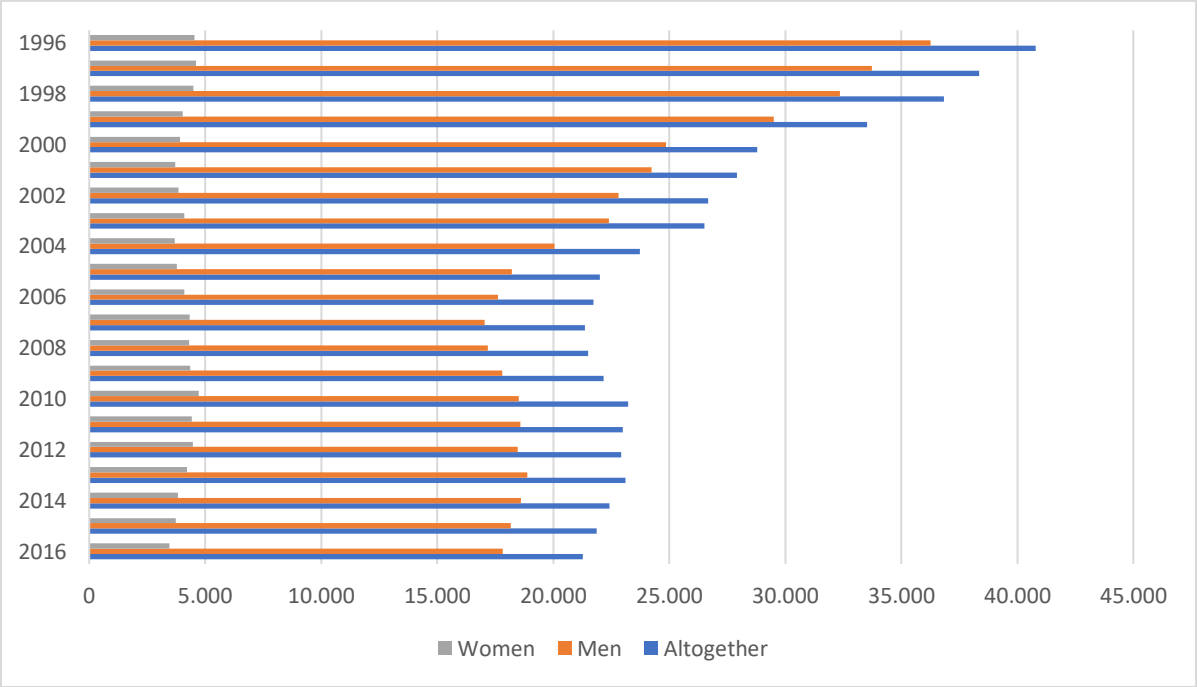

Figure1.2: Master's certificates gained in trades in Germany up to 2016[20]

According to the authors Meier, Mulatz, and Pollack: "In 2020, the labour force (in Germany) will have fallen by nearly five per cent compared with 2010"[21]. In addition to the lower numbers of new qualified workers and masters in the trades, the baby-boomer generation is reaching retirement age, so that the supply of trade services will get gradually worse. There is an urgent need for action.

According to the EU classifications, there are five categories in the building industry:

- Preparatory site work,
- Building and civil engineering,
- Building installations,

[20] Statista, Anzahl der bestandenen Gesellen- bzw. Abschlussprüfungen im deut-schen Handwerk nach Geschlecht von 1996 bis 2016, URL: https://de.statista.com/statistik/daten/studie/244759/umfrage/bestandene-gesellen-bzw-abschlusspruefungen-im-deutschen-handwerk-nach-geschlecht/ (28.02.2018)
[21] Meier, K.; Mulatz, R.; Pollack, F. Mitarbeiter: Schluss mit starren Zeitmodellen. URL: https://www.handwerk-magazin.de/mitarbeiter-schluss-mit-starren-zeitmodellen/150/378/260320 (20.1.2018)

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- Other construction works, and
- Leasing of building machines and equipment with operating personnel.

The focus here will be on the second category – Building and civil engineering. The numbers of apprentices in the construction and building sector fell from 57,490 in 2014 to 54,252 in 2016[22].

The trades requiring apprenticeships in the building and civil engineering sector are as follows[23]:

- Road constructor,
- Special civil engineering constructor,
- Supply pipeline constructor,
- Sewerage constructor,
- Well constructor,
- Railway constructor,
- Building machine operator,
- Joiner,
- Bricklayer,
- Concrete and steel constructor,
- Chimney and furnace constructor,
- Plasterer,
- Wood and building protection specialist,
- Tile and mosaic layer,
- Dry-lining installer,
- Cast stone and terrazzo makers,
- Thermal and acoustic insulation installer and
- Screed layer.

Figure 1.4 shows a decline for bricklayers and concrete workers from 240,900 in 2004 to 202,000 in 2011.

		2004	2005	2006	2007	2008	2009	2010	2011	2012*	2013*	2014*
Total (all occupations)		26,548,000	26,299,600	26,533,900	27,050,500	27,695,400	27,603,300	27,966,600	28,643,600	29,280,000	29,615,700	30.174.500
Non-academic building occupation.		1,050,000	969,800	967,000	973,600	963,400	953,600	966,300	982,500	-	-	-
of which	Building workers	666,600	607,800	609,700	609,800	601,300	598,300	611,600	622,700	-	-	-
	Bricklayers, concrete workers	240,900	216,500	214,700	207,800	202,800	199,300	200,900	202,000	-	-	-
	Joiner, scaffolders	143,500	133,000	134,000	138,600	135,700	134,400	141,100	145,300	-	-	-
	Road+ civil engineering workers	117,700	112,000	112,500	113,300	111,600	111,600	111,700	112,600	-	-	-

[22] Statista, Lehrlingsbestand im Handwerk geordnet nach Gewerbegruppen in Deutschland in den Jahren 2014 bis 2016, URL: https://de.statista.com/statistik/daten/studie/30500/umfrage/lehrlingsbestand-im-handwerk-nach-gewerbegruppen/ (21.2.2018)
[23] Zentralverband Deutsches Baugewerbe. Im Bauhauptgewerbe stehen 18 Beru-fe für eine qualitativ hochwer-tige und moderne Ausbildung. URL: https://www.zdb.de/zdb-cms.nsf/id/ausbildungsberufe-de (15.1.2018)

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	Labourer	164,600	146,200	148,500	150,100	151,200	153,000	157,900	162,700	-	-	-
of which	Fitters (general)	383,400	362,000	357,300	363,800	362,100	355,300	354,700	359,800	-	-	-
	Building fitters	111,100	101,900	100,600	102,900	101,200	100,100	100,400	101,700	-	-	-
	Interior fitters, upholsterers	44,100	41,400	39,800	40,300	39,900	38,800	38,200	38,800	-	-	-
	Painter	228,200	218,800	216,800	220,600	221,100	216,300	216,100	219,200	-	-	-
Academic building occupations.		122,200	117,200	116,300	117,600	121,100	122,500	124,700	128,100	-	-	-

Figure 1.3: Numbers gainfully employed in building trades, as of 30 June (rounded)[24]
*(Detailed data not available due to the introduction of a new classification system.)

The statistics for bricklayers for the period 2012 to 2016 show the same trend, with a 2.3% decline from 94,352 to 92,203[25].

Construction engineering

The development for engineers is very different. The numbers of gainfully employed engineers has been steadily increasing, as shown in Figure 1.4.

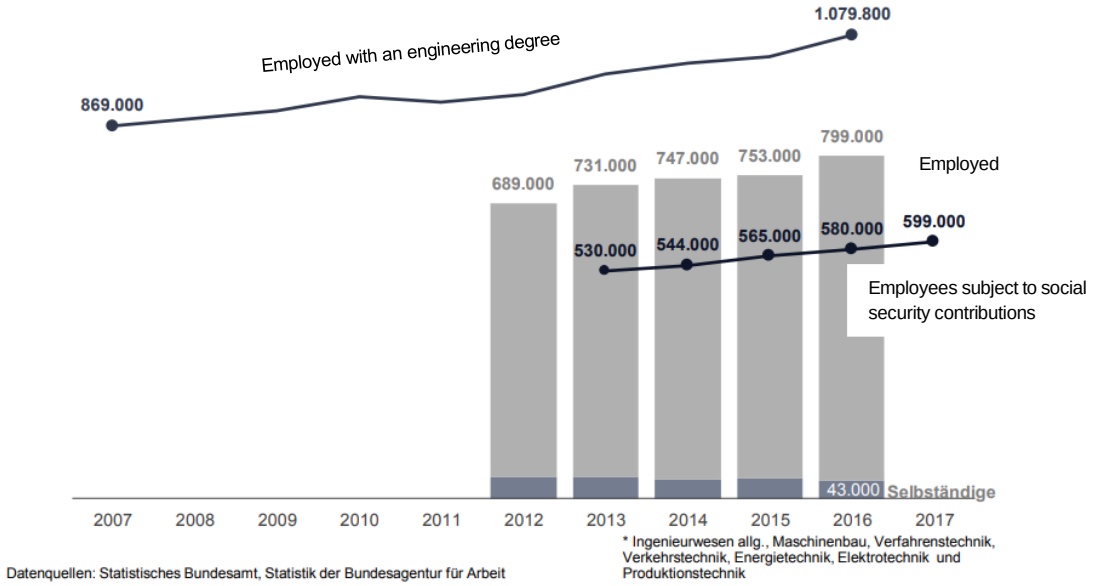

Figure 1.4: Engineering graduates in employment, employed in engineering, or self-employed[26]

However, not all engineering graduates go on to work in this sector. Some 280,000 engineers do not work in this profession. Nevertheless, there has been a steady 3% growth in the numbers that are gainfully employed.

[24] Arbeitsargentur, Der Arbeitsmarkt im Bausektor, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Branchen/generische-Publikationen/Baubericht-2014.pdf (17.2.2018)
[25] Statista, Anzahl der sozialversicherungspflichtig beschäftigten Maurer in Deutschland von 2012 bis 2016, URL: https://de.statista.com/statistik/daten/studie/243149/umfrage/anzahl-der-beschaeftigten-maurer-in-deutschland/ (21.2.2018)
[26] Arbeitsargentur, Ingenieurinnen und Ingenieure, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Berufe/generische-Publikationen/Broschuere-Ingenieure.pdf (17.2.2018)

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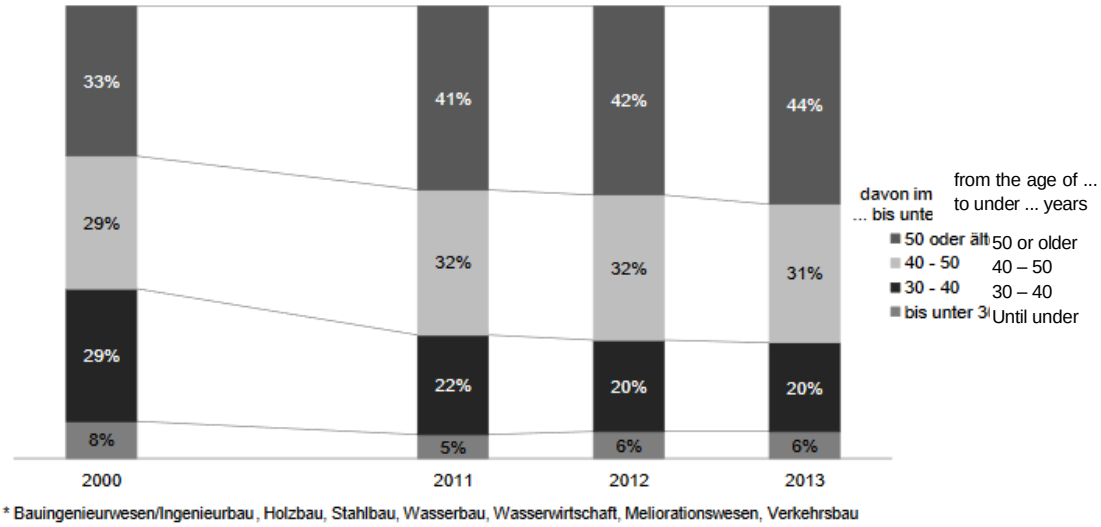

* Bauingenieurwesen/Ingenieurbau, Holzbau, Stahlbau, Wasserbau, Wasserwirtschaft, Meliorationswesen, Verkehrsbau

Figure 1.5: Gainfully employed graduates with a higher education qualification in construction engineering (in age groups)[27]

Figure 1.5 shows the age structure of the gainfully employed construction engineers in four years from 2000 to 2013. It is particularly noticeable that a large proportion of the construction engineers are above the age of fifty. This implies that in Germany more than a third of the jobs in this sector will become vacant over the next 17 years.

A good indicator for the level of demand for engineers is the vacancy period – how long it takes before a replacement is found for a vacant position. In 2017 this was 99 days. The comparable figure for 2010 was 70 days.

Considering the development of gainfully employed architects and engineers, there was decline through to 2005. In the following years the numbers of gainfully employed increased from 373,600 (2005) to 496,100 (2014).

Taking these three factors into account – vacancy periods, retirements, and increased numbers gainfully employed, the overall development is very similar to that of the construction trades.

Meeting requirements for higher education qualifications in Germany

In the German Qualification Framework (DQR)[28], the qualifications are divided into:

- Specialist skills
  - Knowledge and
  - Abilities
- Personal skills
  - Social skills and

[27] Arbeitsargentur, Der Arbeitsmarkt im Bausektor, URL: https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Branchen/generische-Publikationen/Baubericht-2014.pdf (17.2.2018)
[28] Der Deutsche Qualifikationsrahmen für lebenslanges Lernen. URL: https://www.dqr.de/index.php (29.10.2017)

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- Autonomy

The DQR Level 6 that applies for the bachelor's degree and the master's certificate (Table 1.1) describes the skills required for planning, implementation and evaluation of comprehensive specialist tasks and for the independent control of process in sub-section of an academic field or in a vocational field. The complex structure of the requirements is subject to frequent changes.
Table 1.1: Qualifications in terms of specialist skills (knowledge and abilities) and personal skills (social skills and autonomy) in accordance with DQR Level 6 for higher education institutions.

Qualification	Description
Knowledge 1	Have a broad and integrated knowledge, covering scientific foundations, the practical application of a science subject and a critical understanding of the most important theories and methods (equivalent to Level 1 = Bachelor level of the framework for German higher education qualifications)
Knowledge 2	Have knowledge of the further developments of a scientific subject or a vocational field and have relevant knowledge of the interface with other fields
Skills 1	Be able to apply a very broad range of methods for tackling complex problems in a scientific subject (equivalent to Level 1 = Bachelor level of the framework for German higher education qualifications)
Skills 2	Develop new solutions and assess these on the basis of various criteria, also under frequently changing requirements
Social skills	Work responsibly in expert teams or lead groups or organisations and the specialist development of others and deal proactively with problems in the team
Autonomy	Define, reflect on and evaluate targets for learning and work processes, and independently shape sustainable learning and work processes

Qualification goals/Intended learning outcomes
The demand for construction engineers has been very high for some years, and this is intended to remain the case in the coming years[29].

The Bachelor's study programme "Construction engineering DUAL with Master's certificate" is intended to prepare students for a qualified occupational activity in all sectors of construction engineering, i.e. planning, implementation and supervision of building measures. The requisite learning results of the study programme are:

[29] Nachfrage nach (Bau-)Ingenieuren ist hoch – Interview mit H.-U. Kammeyer, Präsident der Ingenieurkammer Niedersachsen. Baurundblick, hrsg. vom Bau-industrieverband Niedersachsen-Bremen e.V., Ausgabe 2, Februar 2017

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Knowledge:	Graduates know the state-of-the-art in construction engineering. This includes basic knowledge of the subject in order to be able to solve engineering problems (conception, design, dimensioning and construction) in the fields framework design, geotechnics, hydro-engineering plants, and traffic installations. They are also able to use their basic technical knowledge to independently develop specialist knowledge from the literature, including industrial standards. Graduates are able to participate as a qualified specialist in both the planning and also the implementation of all sorts of building projects, including maintenance.
Abilities:	Graduates use standard methods and techniques in the planning and implementation of construction work. They are able to adapt methods to specific projects and to develop these further. They can apply control methods and tools appropriately. They work independently, analytically and constructively, and can handle to instruments of project management and Building Information Modelling (BIM).
Specialist skills:	Graduates are able to criticise constructively both their own work and the work of others and can respond constructively to criticism of their own work. They use creativity and intuition and are problem- and goal-oriented. They motivate themselves and are prepared to bear responsibility.
Social skills:	Construction engineers are familiar with techniques for communications, mediation and negotiations. This makes them able to coordinate and mediate in construction projects. They have a clear view of cultural, social and ethical questions and have experience of inter-disciplinary project work. The inter-disciplinary education provides the basis for future leadership responsibilities.

The study programme must comply with the recommendations of the German Association of Departments of Civil Engineering (FBT Bau)[30], which in turn is based on Level 6 of the German Qualification Framework (DQR).

The contents of the study programme are designed to have at least 70% STEM contents (STEM = Science, technology, engineering and mathematics). This entitles

[30] Kenntnisse, Fertigkeiten und Kompetenzen im Kernstudium von Bachelorstudi-engängen des Bau¬ingenieurwesens an Hochschulen für angewandte Wissen-schaften. Hrsg. vom Fachbereichstag Bauingenieurwesen, Stand April 2015
Oberbeck, N.; Werkle, H.: Kenntnisse, Fertigkeiten und Kompetenzen im Kern-studium von Bachelorstudiengängen des Bau¬ingenieurwesens an Hochschu-len für angewandte Wissenschaften. VDI-Jahresausgabe 2015/16 der Zeitschrift Bauingenieur, S. 13 – 18

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raduates to receive an additional engineering certificate from the Chamber of Engineers of Lower Saxony[31].

Eligibility

Expected entrance qualifications

The legal requirements for admission to a Bachelor's degree course in Lower Saxony is defined as follows in the state higher education act (Article18 NHG)[32]

- The general higher education entrance qualification,
- The higher education entrance qualification for a special field, and
- The entrance qualification for a university of applied science.
- A Master craftsman certificate or Technician's certificate, or
- The completion of at least a three-year vocational training course in a relevant field with at least three years occupational experience (see the Admission and Matriculation Regulations (ZIO)).

Further requirement is

- The conclusion of a contract with a practical partner recognised by the university by the start of the first practical phase

The requirements for the Master craftsman exam in accordance with Article 49 (4) of the Crafts and Trades Ordinance (HwO)[33] are as follows:

(1) A pass in the trade exam in the trade subject to authorisation for which the Master craftsman certificate is sought, or in a related trade subject to authorisation, or a corresponding final exam in a recognised vocation or an exam based on a legal ordinance based on Article 45 or Article 51a Para 1 in combination with Para. 2, or holds an equivalent recognition in accordance with Article 40a for the trade subject to authorisation or a related trade subject to authorisation.

(2) A pass in another trade exam or another final exam in a recognised vocation and work for a number of years in the trade subject to authorisation for which the Master's certificate is sought. Not more than three years shall be required for the period of work. Furthermore, the successful completion of the vocational school shall be taken into account with one year for a one-year vocational school course, or two years for a course of two or more years.

(3) If the examinee is self-employed in the trade for which a Master craftsman certificate is sought, or has been a work's master, or has worked in a comparable position, or has gained practical experience comparable to that of a journeyman, then the period of this activity is also to be taken into account.

(4) On application the Chamber of Trades and Crafts may

[31] Nachfrage nach (Bau-)Ingenieuren ist hoch – Interview mit H.-U. Kammeyer, Präsident der Ingenieurkammer Niedersachsen. Baurundblick, hrsg. vom Bau-industrieverband Niedersachsen-Bremen e.V., Ausgabe 2, Februar 2017

[32] Niedersächsisches Hochschulgesetz (NHG) in der Fassung vom 26. Februar 2007 (Nds. GVBl. S. 69), zuletzt geändert durch Artikel 1 des Gesetzes vom 15.12.2015 (Nds. GVBl. S. 384)

[33] Verordnung über die Lehrverpflichtung an Hochschulen (Lehrverpflichtungs-verordnung - LVVO -) vom 2. August 2007 (Nds.GVBl. Nr.24/2007 S. 408), geän-dert durch VO v. 6.5.2008 (Nds.GVBl. Nr.9/2008 S.129)

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(1) Shorten the period of vocational activity previously set as three years after taking into special account the vocational aptitude demonstrated in the trade exam and during the period of vocational activity,
(2) In exceptional cases, waive the requirements of items (1) to (4) in whole or in part,
(3) Taking into consideration foreign vocational qualifications and periods of vocational activity in other countries, waive the requirements of items (1) to (4) in whole or in part.

The Chamber of Trades and Crafts may consult the Master Examination Committee.

Student work load

The limit for the annual work load of a full-time student is set by the Standing Conference of the Ministers of Education and Cultural Affairs of the states in the Federal Republic of Germany (KMK) at 1,800 hours, and for the dual study programme this has to be divided appropriately between the theoretical and practical phases. It is assumed that a credit point (CP) involves an average work load of 27.5 hours:

- From ca. 22th September until ca. 22 th December there is a 13-week theoretical phase (Autumn Semester), and from ca. 22 th March until ca. 22 th June a 13-week theoretical phase in the Spring Semester (each including an examination phase).

A special case is when a student has passed the first level trade exam and wishes to obtain the second level in parallel to the study programme ("Dual²", Table 1.3). This highest level, the Master's certificate consists of

- Part I (Proof of practical expertise in the special field),
- Part II (Proof of theoretical knowledge in the field),
- Part III (Proof of management skills) and
- Part IV (Proof of trade and work instruction ability).

Part IV corresponds to the instructor exam in accordance with the Ordinance on Trainer Aptitude (AEVO). As an alternative to the Master's certificate, taking only the exams of Parts III and IV can lead to qualification as a "Business management specialist" (*Kaufmännische Fachwirt*).

Table 1.3: Parts of the Master's exam required in addition to the BAU study programme

Vocational training as	**Study programme**	**Required parts**
Bricklayer, concrete worker, joiner	BAU	III, IV [1]) [2])

[1]) Part III of the Master's exam can be waived for BAU students on graduation if they have additional taken the courses RWJ, WIR and PBR

[2]) Part IV of the Master's exam is regularly offered as a key qualification

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Under the Cooperation Agreement with the Chamber of Trades and Crafts only the parts shown in Table 1.3 are required, so that the additional work load for the students is considerably reduced. With the exception of Part I of the Master's exam, which is no longer required in the main construction occupations anyway, the missing parts are offered in courses that are coordinated with the rest of the timetable. As a rule, the examination for Master/ Business management specialist does not lead to an extended period of study.

Quality assurance/Successful completion of the programme
The quality management of the university is process-oriented and has been developed based on the "Student Life Cycle" in accordance with EN ISO 9001:2015 and EN ISO 29990 for learning service providers. The quality management has the key tasks of ensuring the quality of the study programme and the teaching and research. Details of the organisation are provided in a quality management handbook.

8.12 Decision
After consultation with chambers, administrations etc. as well as intensive consultations and unanimous decisions of the project consortium, it was decided to implement Model A within the framework of the project in Germany. The project partner hochschule 21 takes on the task. The implementation begins on 01 September 2018.

After completion of the module manual for the dual, integrated study course "Electrical Engineering", the project partner hochschule 21 in Germany examines the conditions to implement this study course in Germany. In the positive case, an implementation will be prepared during the project. However, implementation will inevitably only be possible after the end of the three-year project period.

8.2 Lithuania
8.21 Analysis of existing Situation in Lithuanian higher Education Institutions of Electrical Engineering professional Bachelor Training[34]

Summary of the situation
To determine the general situation in the preparation of electrical engineers (Bachelor) in Lithuania, Lithuanian higher education institutions (universities and colleges) were examined. Additionally, discussions were held with the most important associations such as the Lithuanian Builders Association, the Lithuanian Railway and the Lithuanian Electricity Association, as well as with heads of individual companies (electrical engineering, construction).
Table 1 shows the current figures for the preparation of electrical engineering students at Lithuanian universities. In discussions with the above-mentioned bodies, it emerged

[34] Prepared by the Project Partner Vilnius Gediminas Technical University

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that companies are interested in preparing such specialists (bachelors-masters[35]). This creates favourable conditions for practical training in companies.
In the construction sector such specialists (Bachelors-Masters) are very much lacking. Due to the great shortage of specialists, it often happens that the master craftsmen of self-study work.
The current situation is therefore favourable for the preparation of Bachelor's degree- and master craftsman qualification courses in electrical engineering, as there is a noticeable need for them.

Training of electrical engineering specialists in Lithuanian higher education institutions (universities and colleges)

The numbers of electricial engineering Bachelor's students' preparation in Lithuanian higher education institutions are given in table 1.

Table 1. Preparation of the electrical engineers in Lithuanian universities and colleges

Position	***University/College***	***Program***	***Number of graduates per year***	***Notes***
Universities				
1.	Vilnius Gediminas Technical University	Automation	25	
		Electrical energy engineering	20	**New program**
2.	Kaunas University of Technology	Automation and control	40-50	
		Electrical engineering	20	
3.	Klaipėda University	Electrical engineering	20	
				Total≈130
Colleges				
1.	Kauno Kolegija/ University of Applied Sciences	Automation and control	20	
2.	Kaunas University of Applied Engineering Sciences	Electrical energetics	25	
3.	Klaipeda state university of Applied Sciences	Electrical and automation engineering	15	**New program**
4.	Panevezys University of Applied Sciences	Electrical and automation equipment	15-20	
5.	Šiauliai State College	Automation and electrical engineering	15-20	
6.		Electrical energetics	15-20	

[35] The text further refers to Bachelors-Masters as graduates of the integral course of study who obtain a Bachelor's degree and master's qualification.

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	Utena University of Applied Sciences	Automation and electrical engineering	15-20	
7.	Vilnius College of Technologies and Design	Electrical engineering	15-20	
		Electrical and automation engineering	15-20	
				Total ≈150

Table 1 shows that about 280 electrical engineers are trained at Lithuanian universities every year. Of this number, 40 graduates can be discarded, as these programmes are new, and students will graduate from universities and colleges only in 4 years. In the current situation there are about 240 graduates per year. There are no statistics on how many graduates work in the field of specialization, but the actual situation in the first part of the report shows that not all.

Orientation demand of the electrical engineering (Bachelors-Masters) specialists
Approximate demand of electrical engineers

Currently, the Lithuanian electricity sector requires, depending on the type of activity, specialists in the following fields: electrical engineers operating users of electrical equipment; electricians working in power plants; operators of electrical equipment; operative workshops; installers of electrical equipment; workers.

According to the Lithuanian Statistical Office, a moderate 5000 employees in the electricity sector are certified each year in Lithuania. Considering the fact that recertification is carried out every 4 years, there are currently about 20,000 certified employees in the Lithuanian electricity sector.

To say that the generation of people is renewed every 30-40 years, we will receive:

$$\frac{20000}{30} = 666; \frac{20000}{40} = 500;$$

On average, about 500-666 workers in the field of electrical engineering are required each year.

According to the Lithuanian Statistical Office, there were 5700 vacancies in Lithuanian industry and construction in the fourth quarter of 2017. At around 10%, these are around 570 job vacancies in the electrical engineering sector. Of this figure, about 2/3 could be Bachelor's Masters, i.e. about 342 Bachelor's Masters specialists.

During discussions with heads of the companies who work in the field of electrical engineering it turned out that they are very interested in the preparation of such specialists (bachelor-masters). Many companies are absolutely satisfied with theoretical knowledge of the universities and colleges graduate students, but practical preparation does not meet their expectations. Most of the companies said that the practical skills

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of the new employees, which is the first job after graduating from the universities or colleges must be taught by themselves.
Also, should be noted that the graduate students form the universities are more interested in design and management work in the field of electrical engineering than in electrical installation. However, it shows that there is a greater need in Bachelors-Masters specialists in the era of electrical engineering.

Construction sector

Approximate demand of electrical engineers

In the current situation, the Lithuanian construction sector requires a dual use of electrical engineering specialists: firstly, automation specialists, secondly electricians (working indoors and outdoors).
About 100,000 people work in the Lithuanian construction sector. Including about 12%, which is about 12 thousand, are related to electrical engineering work.
If we accept that the generation of people is renewed every 30-40 years, then we will receive:

$$\frac{1200}{30} = 400;\ \frac{1200}{40} = 300,$$

From the above formula we can say that on average about 300-400 workers of this speciality are needed every year. This number is distributed in this way: every year about 100-130 automation specialists and about 200-260 electricians are needed. These are indicative figures for technical schools.

Approximate demand for electrical engineering bachelor-masters

In Lithuania, the construction sector today employs around 18,000 certified construction managers. Including about 12%, that is about 2160 workers connected with the field of electrical engineering. If we accept that the generation of people is renewed every 30-40 years, then we will receive:

$$\frac{2160}{30} = 70;\ \frac{2160}{40} = 50,$$

From the above formula we can say that on average about 50-70 BachelorIs-Masters in electrical engineering are required every year.

Lithuanian railways

In Lithuania, the electrification and automation of individual railway sections has recently been carried out. The volume of this work will not decrease in the near future. For the installation of service bases in the railway contact network, experts from the fields of automation and electrical engineering are needed. For this purpose alone, around 60 high-tech electricians are needed. About 2/3 of these could be Bachelors Masters. That would be about 10 people per year. The electrification work on individual

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sections of the line has to be doubled even more. A total of 30-50 specialists are needed every year.

Conclusions

1. Electrical engineering Bachelors-Masters in Lithuania's various profile companies are very necessary. Because they are lacking, in many cases the self-study masters are working.
2. There are currently about 600 shortages of employees in the field of electrical engineering in Lithuania. Therefore, the number of graduates with electrical engineering qualifications prepared by universities and colleges does not meet the current market situation.
3. Lithuanian railways have been modernized in recent years, which has led to a significant increase in the need for the specialists from the field of electrical engineering. Lithuanian railways each year will accept about 50 bachelor-masters.
4. Regarding the natural labor force renewal, the need for electrical engineering bachelor-masters specialists, having regard to the number of their training in Lithuanian higher education institutions, will be constant.

8.22 Analysis and determination of required legal requirements and conditions[36]

General Provisions

1. Study programs should be prepared on the basis of the description of the qualification structure of Lithuania (Official Gazette, 2010, No. 56-2761), a description of the general requirements for the first cycle and integral study programs, which are approved by the Minister of Education and Science for 2010. April 9 Order No V-501 (Official Gazette, 2010, No. 44-2139, Official Gazette 2012, No. 21-977), Description of Continuous and Continuing Studies (Official Gazette, 2009, No. 59-2325), General Requirements for Joint Study Programs, approved by the Minister of Education and Science in 2011 July 29 Order No V-1468 (Official Gazette 2011, No. 99 4679), Description of the Study Degrees, approved in 2011 November 21 Order No V-2212 (Official Gazette, 2011, No. 143-6721), the Regulation on the field of study in the field of general technology science (engineering studies) and the Regulations of the Studies of the Vilnius Gediminas Technical University.

Definitions used in the description:

Study credit is a unit of study subject volume measuring the study results and student's working time. One academic year (1600 hours of contractual study) corresponds to 60 credits. One theoretical study week equals 40 contractual student hours and corresponds to 1.5 credits. One internship week is from 32 to 40 contractual student hours and corresponds to 1.2-1.5 credits.

[36] Prepared by the Project Partner Vilnius Gediminas Technical University

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The study module is an independent study subject covering various forms of study: lectures, laboratory works, exercises, seminars, students' independent work, design work, practices, other forms of study and combinations of study forms. The study program consists of a course or a part of the study course, a course project, a complex course project, internships and a final project / work module. The minimum number of credits for the study subject module is 3 credits, while the minimum number of credits step is 1 credit. The recommended step number of credits for the study subject module is 3 credits.

Module a part of the curriculum consisting of several content related subjects, which includes several study modules, having a definite purpose and focusing on certain student abilities; The minimum module volume is 12 credits. The step number of credits in the module is 3 credits.

General Requirements for Study Programs
The volume of first cycle postgraduate study programs is 210 or 240 credits (depending on the study duration and internal university decision).

The duration of the first cycle of continuous university studies − 4 years. By the internal university decision, a permanent university study program can be established for 3.5 years with a volume of 210 credits.

The intensity of continuous studies - 60 credits per year. With internal university decision, the intensity can be changed.
The program, after which the Bachelor's degree is awarded, consists of three target parts:

Part (A) – general university subjects, covering issues of philosophical outlook and general erudition higher education, which are not directly related to the content of the studies of the regulated field. The subjects of humanities and social sciences and arts are chosen for the development of general erudition, and the subjects of physical and biomedical sciences are devoted to the studies of art and social sciences. The volume of general university subjects must be at least 15 credits.

Part (B) – covering theoretical and professional subjects, is obligatory for all study programs of the field and provides the knowledge and skills necessary for obtaining a bachelor's degree in the field. This part forms the core of study in each study program. This part also includes special subjects, practices and final projects. The volume of the study fundamentals is at least 165 credits.

Part (C) – The volume of this part is no more than 60 credits. The part of the specialization may consist of:

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University-determined and student-selective subjects for deeper specialization in the same field.
Student-freely chosen subjects.

The volume of the practice must be at least 15 credits.
The final project / work volume must be at least 15-18 credits.

Summary of general requirement for study programs

A	**General university subjects**	**>=15**
A1	Fundamental subjects	
A2	Humanitarian, social or artistic subjects	
B	**Theoretical and professional subjects**	**>=165**
B1	General Theory subjects	>=30
B3	Main subjects of the study field	
B4	Subjects in Social Sciences	15
B6	Professional and Cognitive Practice	15-21
B7	Final Project	15-18
C	**Subjects of the specialization**	**<=60**
C1	Subjects for deeper specialization	
C2	Student-freely chosen subjects	
Overall:		**210 or 240**

Study program structure
Fundamental worldview subjects covering the philosophical and historical foundations of physical and technological sciences

- Humanitarian, social or artistic studies
- Specialty language, cultural studies
- Foreign language studies

Division of study subjects in the field of engineering and technology (B) (study program core):

- General fundamentals of technology. At least 66 credits:
  general theoretical subjects in the field of technology science: mathematics, physics and chemistry. Not less than 36 credits, of which mathematics are not less than 21 credits;
  other general subjects in the field of technology science: mechanics, electrical engineering, electronics, materials science, information technology, engineering graphics, environmental and human safety - at least 30 credits.
- The main subjects of the study field are not less than 40 credits.

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- Subjects in social sciences: economics, management, law and others - at least 12 credits.
- Special subjects in the field of study are at least 17-20 credits.
- Professional practice - minimum 12 credits.
- Final project (preparation and defense) - 15-18 credits.

Part (C) of a specialization, not exceeding 60 credits, must consist of:

- Not more than 52 credits for the University and selected by the student for specialization subjects.
- Student freely chosen study subjects – 8 credits.
  The study program must provide at least 4 possible subjects to select from.

It is necessary to provide at least one course work in social sciences. The final project must be started not later than in the 7th semester.
Part B and Part C of the study program may include optional modules.

Full time studies structure

- General Characteristics of Continuing Studies Structure:
  a) Each study year has two semesters. The semester consists of a period of sessions, a session, a period of training and defense of the final project / work.
  b) The volume of studies for all semesters is 30 credits.
  c) The usual course duration is 16 weeks, of which 1 week is self-study. The duration of the sessions in which professional practice is organized is 13 weeks. This period also includes 1 week of self-study.
  d) Educational / cognitive practices are organized in the 2nd or 4th semesters. The volume of these practices is up to 6 credits.
  e) Occupational practice is organized at the end of the 4th and 6th semesters. Each practice is up to 8 credits. These practices can be combined into one after the third course - the beginning of the 7th semester - up to 15 credits.
- The total number of compulsory study subjects, course projects, integrated course projects and practice modules per semester may not exceed 7.
- The course projects number, which is an integral part of the subject modules, must not exceed 2 in a semester.
- Specialization in the program may be provided not earlier than the 5th semester. The volume of specialization subjects must be 30 to 52 credits. These include the final project / work and practice.

8.23 Decision

After consultation with chambers, public administrations, universities etc. as well as intensive consultations and unanimous decisions of the project consortium, it was decided to implement Model B within the framework of the project in Lithuania by the

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project partner Vilnius Gediminas Technical University. The implementation should start immediately after the official accreditation of the new study programme, if possible, during the project period.

After completion of the module manual for the dual, integrated study programme "Building and Real Estate Management", the project partner Vilnius Gediminas Technical University and hochschule 21 will examine whether this study programme can also be implemented in Lithuania. In the positive case, an implementation will be prepared during the course of the project. However, implementation will inevitably only be possible after the end of the project within the framework of the three-year project implementation period.

8.3 Poland and Finland

According to the project application, it was planned to develop module manuals for the study courses "Building and Real Estate Management" and "Electrical Engineering" and to start implementation in Germany during the project period. After the current progress of the project, the implementation of another integral study programme in Lithuania should also be started if possible.
In contrast, no implementations were planned for Poland and Finland during the project period following the project application. In these two countries, the possibilities of implementation are to be investigated and, in the event of a positive result, implementations are to be prepared. Accordingly, in Poland and Finland the concepts and models for dual, integral degree programmes described above were discussed and agreed in detail with universities, chambers as representatives of the companies, public administrations etc. with the following results and decisions.

Poland

Wielkopolska Craft Chamber in Poznan[37]

In Poland there is a state-approved master craftsman training with an official examination, which is approved by the relevant chamber. However, the level of training does not (yet) correspond to the German master craftsman training. In Poland, there is a strong interest among the chambers and their affiliated companies to further develop the existing master craftsman training and to reach the German level in the medium term, if possible even exceeding it. The first model project in this field was successfully implemented in the Pomeranian Voivodeship between 2015 and 2018.[38] The results of this pilot project are decisive foundations and benchmarks for designing a dual Bachelor's study course with integral attainment of a Bachelor's and vocational Master's degree in Poland.

[37] Designing and implementing a dual Bachelor's degree study course with integral attainment of a Bachelor's and Master's degree (Bachelor & Meister), Report Report on Project Partner Wielkopolska Izba Rzemieslnicza w Poznaniu, May 2018
[38] Hanse Parlament, Common Vocational Training to Master in the Baltic Sea Region (Master BSR), Hamburg 2018

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Dual study programmes have so far only been found in individual cases in Poland. They are primarily implemented by private universities, often in cooperation with German universities or large German companies that have a subsidiary in Poland. Two examples of such dual courses of study are briefly outlined below[39].

At **Stanisław Staszic State Vocational Higher School in Piła** the dual studies are accessible in the following branches: construction, electrotechnology, mechanics, machine building and transport.
The dual studies are a project which connects acquiring the academical knowledge and professional experience.
The main characteristics of the studies is the dominant number of practical courses in comparison to the traditional studies.
Since the beginning of the second term the student may be invited to take part in the dual study project. The dual studies project is strictly oriented to the needs of entrepreneurs thus the recruitment for the dual studies is organized by the company; its representatives consider such factors as language competences and the average grade. The outcomes of the recruitment interview are also taken into account while choosing a candidate for dual studies project.
The dual studies start usually with summer practice after the fourth term. Then, in the fifth term the student takes part in theoretical courses at the high school for four days and one day is devoted to the vocational practice in the company. In the sixth, seventh and eighth term the student has two days of professional training in the company.
The students earn a wage for vocational training and he/she can receive the certificate which confirms the acquired knowledge. After graduating from the high school, the student will have the engineer diploma and professional experience.
For the time being, 38 enterprises have signed the agreement with the high school in Pila. The majority of them are capital companies registered as sp. z.o.o. (*GmbH*).

The **Poznan University of Technology** has introduced also the dual study project with its main partners: Volkswagen Poznań and Phoenix Contract Wielkopolska for automation and robotics.
The dual studies start up in the third term. For the beginning students take part in practical course in company in one day in a week. Then, in the later terms students will have more practice – up to three days.
The project's participants are paid for the practice in the company. However, the project included only fourteen people – only these who were positively assessed in the recruitment process. Additionally, students will have the possibility to take an exam at

[39] Designing and implementing a dual Bachelor's degree study course with integral attainment of a Bachelor's and Master's degree (Bachelor & Meister), Report Report on Project Partner Wielkopolska Izba Rzemieslnicza w Poznaniu, May 2018

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the Polish - German Chamber of Commerce and Industry and to obtain qualifications of mechatronics fitter.
Similar studies are foreseen also for the faculty mechanics and machine building. The studies seem to be organized in a slightly different way – the studies contain six months of paid summer practice in a company and then one day of practice in a week in all terms. In each term one laboratory course takes place in industrial plant.
The courses which are to be organized by the company:

- Machining - 3rd term, 15 hours practice, 15 hours. laboratory,
- Technical metrology 4th term 15 hours practice
- Technological process' designing - 5th term 15 hours designing
- Structural design - 6th term 45 hours designing
- Maintenance and exploitation - 7th term, 30 hours lecture
- Optional subjects - 6th and 7th term - 60 hours

Although the dual courses of study existing in Poland do not fully meet the requirements of the project in different respects (e.g. division between practical training in the company and training in the university), it should be noted that in Poland dual, integral Bachelor's courses of study are generally possible and there is a special interest in their realisation.
Therefore, first consultations were carried out with few craft representatives who relate to construction professions. The most important conclusions which could be drawn are as follows:

- There is a need of better qualified craftsmen, especially in term of economic and business management. The core competences in that matter which craftsmen would have is finding the financing and marketing.
  No one has pointed the knowledge in taxation, social payments – many entrepreneurs are cooperating with business care services like e.g. accountancy office.
- Craftsmen should be better educated in term of pedagogics and psychology – this would enable them to have a better approach to their employers in solving problems. The competences in teaching are also essential for vocational training – the training master can have an overwhelming influence on the young person – not only on his/her professional skills, but also on the student's personality. That is very important in preventing early school leaving.
- The dual studies with integrated Bachelor's/master craftsman degree may be useful for people who got their enterprise inherited. Such people are usually running small business, so they have to deal with economic and law issues, but they also need the knowledge about products they sell and production process.
- The dual studies, thanks to cooperation with small enterprises, can create a possibility for students to enhance them to set up their own business. The other dual studies in Poland offer the students work in medium enterprises which is

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not necessarily in favor of creating own business. The student works in a company as a specialist in their chosen field and have no overview on other aspects.

As there is a special interest and need in the construction sector in Poland, the project will continue on the basis of the module manual "Construction and Real Estate Management" and the implementation experience in Germany.
a) comprehensively examined the implementation possibilities,
b) develop an implementation concept based on Polish conditions and
c) in the case of a positive outcome, a realisation is prepared.

In addition, from 2019, project partner Poznan University of Life Sciences plans to introduce a dual degree program in the specialization of Wood Technology. These activities should be closely linked to the further implementation of the project in Poznan. In this context, the modules "Business administration, law and management" of the dual study program "Construction and Real Estate Management" of project partner Poznan University of Life Sciences in cooperation with project partner Wielkopolska Izba Rzemieslnicza w Poznaniu will also be tested practically during the project period.

Poznan University of Life Sciences[40]

Representatives of academic teachers and students from the Faculty of Wood Technology of Poznan University of Life Sciences in the research performed within Bachelor & Meister project recognized that dual studies are necessary for improving the level of preparation of young professionals to start their career path. Education should be closely related to the industry, especially in engineering faculties. Graduates are more and more often required to represent not only theoretical but also practical knowledge and skills.
According to the Department of Furniture Design of the Faculty of Wood Technology, dual studies are very necessary to gain practical knowledge, which is difficult to achieve, while learning theoretical issues concerning a specific problem. Solving problems in a company allows to face a real problem that requires us to get involved in a given moment and make the right decisions in a very short time.
Our research shows students would like to take part in this type of studies. In their opinion, dual studies allow to gain specific, practical knowledge. They also give the opportunity to establish contacts in companies and their employment in a given position after the studies.
In a sense, dual studies are a response to the growing demand of specialists in various countries. Therefore, it seems necessary to create such studies that will not only improve the quality of education, but also the quality of services available on the market.
In connection with the above, since October 2019, dual study course will be

[40] Designing and implementing a dual Bachelor's degree study course with integral attainment of a Bachelor's and Master's degree (Bachelor & Meister), Report on Project Partner Poznan University of Life Sciences, February 2019

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implemented at the Faculty of Wood Technology. It confirms that the need for dual studies has been noticed in the mechanical processing of wood and wooden constructions and is being implemented in the practice.

PULS representatives analyzed the various options of the study programs:

• The first option of the study program

In each year of study, the student takes one month to attend a higher school theoretical courses (specialty, management, economics, law, informatics, pedagogy, etc.), in the next month – he will spend in the company by carrying out practices.

• The second option of the study program

In each year of study, a student half of the semester (September, October, and a half of November) will spend at a higher school by attending relevant theoretical courses and the other half of the semester (half of November, December and January) - in the company by carrying out practices.

In the spring semester, respectively, at the higher school - in February, March and half in April, the next half of the spring semester – April, May and June - in the company.

• The third option of the study program

In each year of study, the student passes the autumn semester in higher school while listening to the theoretical courses of the corresponding specialty at the undergraduate level, and spring semester in the company by carrying out practices.

All options assume the division of time spend at the university and in the factory. In each option of the study program the student will spend 50 % of that time at the university (learning theoretical issues) and 50 % of the time in the company by doing a practical task. Nevertheless, the vast amount of knowledge needed to perform a given task (in the case of wooden constructions) prompts respondents to accept the second option. Students also approve the second option which would enable contact with the company during both semesters. They could also verify the knowledge gained during the classes in the real time environment.

Representatives of academic teachers analyzed also two basic models for a dual Bachelor's study course with attainment of a Bachelor's degree and a Master craftsman qualification.

The following are comments on two study courses with master craftsman training:

a) dual Bachelor's study course "Construction and Real Estate Management" with integrated master craftsman training in construction-related professions,

b) dual Bachelor's study course "Electric Engineering" with integrated master´s training in electrical occupations,

concerning two different integration models of Bachelor's and master craftsman education:

a) model A "Recognition of academic achievements in parts of the master craftsman's examination",

b) model B "Integral attainment of master craftsman training and Bachelor's degree under the study framework".

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Model A will be used for the Bachelor's study course "Construction and Real Estate Management" and model B for the Bachelor's study course "Electrical Engineering".

Model A: Bachelor's study Course "Construction and Real Estate Management"

1. The project described above is unfortunately enigmatic, vague and does not explain the dual nature of the studies. The student is unable to deduce what is the nature of the studies, what their duality is, how many weeks in the semester is theoretical and how many practical classes.
2. The implementation of the Business Administration course is imprecisely described.
3. What is the relationship with the study program?
4. What is very interesting is that, students are tasked with solving the problems of comprehensive management of the whole life cycle of a real estate object, starting from the initial concept to the appropriate administrative concepts. In this line, students stay in close cooperation with partners from the construction and real estate companies. It is noteworthy that students develop practical real estate projects from various market segments. The modular learning structure allows for the recognition of academic achievements at universities in Europe.
5. In the opinion of the Head of the Department of Furniture Design, the integration of the master craftsman training is incomprehensible. He also questions in which period the training should be carried out?
6. The Bachelor's study program integrates all examination-relevant requirements of the master craftsman examination of parts I to III. It is a very good and practical solution supporting vocational education of students.
7. Under this program, students can select either the Bachelor's degree only or, if they wish, they can additionally acquire also the Master's degree. For students who are seeking both Bachelor's or Master's degrees, the module "Preparation for the training qualification exam" should be obligatory.
8. Admission criteria are not precisely specified. It should be specified exactly what certificates, diplomas, and competences entitle you to study in a given field. In this case, optional descriptions should be avoided in making decisions about admission to university.

Model B: Bachelor's study Course "Electric Engineering"

1. The aim of the master craftsman training in the field of electrical engineering is to autonomously manage a company, to perform leadership tasks in areas of technology, business and personnel management and development, to carry out vocational training and autonomously implement professional competence schemes, while adapting to new requirements in these areas.
2. This description is complete, comprehensive and comprehensible to potential students, and the qualifications program does not raise any doubts.

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3. As part of this project, it is planned to design and implement an integral program of undergraduate and graduate studies in the field of electrical engineering, with particular emphasis on energy and construction technologies.
4. The aim of this study program is to train highly qualified, practice-oriented and scientifically educated specialists and business leaders.
5. The areas of employment of future graduates are very well presented.
6. Integration of the master craftsman education is presented competently and comprehensibly. These qualifications are an integral part of the common system.
7. The Bachelor's degree program with integral master´s qualification prepares students for all parts of the master's examination and fulfils all conditions of a Bachelor's study program. The final exam should be structured as a single exam before a mixed examination board.
8. Admission criteria are not precisely specified. It should be specified exactly what certificates, diplomas, and competences entitle you to study in a given field. In this case, optional descriptions should be avoided in making decisions about admission to university.
Despite the above comments, we recommend the model A to be implemented due to the fact that this model is closely related to the field of Wood Technology, and in particular to the specialization of wooden constructions. Moreover as indicated earlier we strongly recommend to introduce the dual study course in the field of wood technology. We are convinced it would be very beneficial for the development of the furniture and wood technology industry in Europe, improving its competiveness. Based on our research there is a potential interest both on the side of students and academic teachers to introduce the dual study course.

Finland
Satakunta University has conducted a comprehensive feasibility study on the introduction of dual vocational education and training systems, which leads to the clear conclusion that dual education is not legally possible and politically desirable in Finland and is predominantly rejected by science and industry.
„Because the Finnish vocational education system is regulated country wise by several decrees and acts, and the structure, length and main content of the voca-tional education is fixed, it is impossible to apply the proposed vocational educa-tion as such into the national or regional level. The application of the proposed system into the Finnish education system would need the complete reform of the legal framework and of the national requirements.
The proposed vocational education system is not possible unless major educa-tional reform takes place in Finland.
There will be several challenges with the proposed German dual studies, espe-cially concerning the huge amount of practical training. The financial situation is one of the key elements for offering training places. Another challenge will be the time needed for supervision of the student. The most important thing will be the competence of the

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workplace instructor in the company. Instructors should have skills to interact between workplaces, educational institutions and students. So, the question is not only instruct-ing the work, but also the professional devel-opment of the student and the profes-sional development of the instructor him/herself.
In the Satakunta region the WinNova Länsirannikon Koulutus Oy Ltd and The Sa-takunta Educational Federation, Sataedu, are licensed to give vocational train-ing. Dur-ing this study both institutes were contacted, and comments on the Ger-man dual stud-ies were asked. Unfortunately, the replies verified that the Ger-man dual study concept is not possible to be applied as such.[41]

These results of the feasibility study are fully confirmed in this project. The developed concept has been intensively reviewed and evaluated by project partner Satakunta University of Applied Sciences. In addition, it was advised by ten co-operative partners including chambers of commerce, trade association, institutes of vocational education, Finnish national agency of education and Finnish education evaluation center. The partner's recipients were asked to comment the concept. The following excerpts from the extensive comments provide an overview of the assessments.[42]

- In Finland, vocational master-level is not officially known nor recognized. There is no interest in a vocational master education.
- In universities of applied sciences, the number of students in engineering with vocational background has been quite high, up to 35 - 40%.
- In universities of applied sciences, the situation is two-fold: some degree pro-grammes accept vocational studies, some do not, i.e. electrical engineering ac-cepts, but construction does not.
- The education level of new entrepreneurs was studied in Finland, and one of the findings was, that, although the attitudes to entrepreneurship in universities are changing positive, the higher education a person had, the less probably he became an entrepreneur. It is thought that there are two main reasons for this: 1) there are not so many branches in Finland where the academic diploma would benefit the entrepreneurship, and 2) one part of academic studies is learning the scientific way of thinking. Scientific way of thinking, on its' part, con-tains a) avoiding the risks and b) building everything on the base of existing knowledge. Both principles do not belong together with innovative thinking and accepting the risks, which are essential parts of contemporary entrepreneur-ship.
- In Finland, the contemporary law concerning vocational education pays more attention to co-operation between vocational schools and workplaces, particu-larly in phases of training and workplace learning. The law is relatively new and no experience how it works is available now.

[41] Satakunta University of Applied Sciences: FEASIBILITY STUDY OF THE DUAL STUDIES IN THE SA-TAKUNTA REGION, in Dual vocational training for the qualification and integration of youth for strengthen-ing the innovation and growth in SMEs, EU Strategy fort he Baltic Sea Region, 2015
[42] Report by the Projekt Partner Satakunta University of Applied Sciences, June 2018

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- In Finland Chambers of Commerce are not involved in organising degree-based education.
- The traditions and foundations of vocational and academic disciplines are as far of each other as are day and night. This is good to bear in one's mind when putting them together. Furthermore, it has been said that the members of parliaments and other decision makers are more willing to simplify the education system than those involved with separated national dualistic models.
- At Satakunta University of Applied Sciences in the construction engineering programme student can complete so called building production option, where 30 ECTS (in addition to the normal 30 ECTS practical training) will be completed on the construction site. Some other Universities of Applied Sciences apply these studies also in other fields of engineering.
- What comes to the qualifications for Bachelor's engineers in construction the education gives only the theoretical education for competencies. These are strictly given in the FISE qualification system, see http://fise.fi/en/. After three years of practical work (after graduation) employees can apply for official recognition.
- At Universities of Applied Sciences student must have 3 years working experience before entering into Master's studies. At universities students do not need 3 years working experience between Bachelor's and Master's studies.
- The legislation here in Finland is setting certain restrictions. What are you going to do with this?

In summary, it can be stated that in Finland the introduction of dual education systems is not legally possible or politically desired. Universities and industry also refuse dual training systems or are sceptical about them. This has the following consequences for the further implementation of this project.

1. In Finland it is not possible to have dual courses of study with a master craftsman's diploma and a recognised master craftsman's certificate. The dual courses of study developed in the project, "Civil Engineer" and "Electrical Engineering", can be used as dual bachelor courses of study without master craftsman training if adapted to national conditions.
2. Project partner Satakunta University of Applied Sciences takes on other tasks in the project which relieve other partners and thus create the scope for the realisation of originally unplanned activities in other countries, for example the accreditation and implementation of the "Electric Engineering" degree programme in Lithuania.
3. Project partner Satakunta University of Applied Sciences will receive the concepts and module manuals for the two dual study courses "Civil Engineer" and "Electrical Engineering". The partner will provide comprehensive transfers, dissemination and consulting services for both courses of study developed in the project in Finland. Dual study programmes can be implemented in Finland without master craftsman training.

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Comprehensive transfers, consultations, examinations, etc. are to take place with the same aim:

- Implementation of degree programmes in Finland without master craftsman training.
- Use of individual modules by integration into existing study programmes or as welfare modules for students of different study programmes, for example the modules developed within the framework of the two study programmes.
  - Business Administration or
  - Vocational and occupational pedagogy

  with a total of about 450 hours.
- Use individual modules and other results for other educational activities of universities, colleges and continuing education institutions, for example in the context of vocational education and training and adult education.

In this context, appropriate changes and adaptations to Finnish conditions can be made.

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