

Hans Mustermann

This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1. HOLDER OF THE QUALIFICATION

1.1 Family Name / 1.2 First Name

Mustermann, Hans

1.3 Date, Place of Birth

1990-01-01, Wernigerode

1.4 Student ID Number - Enrolment Code

21800

2. QUALIFICATION

2.1 Name of qualification and title conferred (in original language)

Bachelor of Engineering (B.Eng.)

Title Conferred (full, abbreviated; in original language)

Does not apply

2.2 Main Field(s) of Study

Smart Automation with the field of study Automation with the specializations:

- Mechatronics
- Smart Home / Smart City
- Internet of Things
- Renewable Energy Systems
- Smart Factory
- Smart Devices

2.3 Institution Awarding the Qualification (in original language)

Hochschule Harz - Hochschule für angewandte Wissenschaften (FH)

Status (Type and Control)

University of Applied Sciences / State University

2.4 Institution Administering Studies (in original language)

Hochschule Harz - Hochschule für angewandte Wissenschaften (FH)

Status (Type and Control)

University of Applied Sciences / State University

2.5 Language(s) of Instruction and Examination

German and English

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3. LEVEL OF THE QUALIFICATION

3.1 Level

EQF/DQR level 6; graduate / first professional qualifying degree with degree thesis

3.2 Official duration of programme in credits and years

3.5 years with 7 semesters, 210 ECTS

3.3 Access Requirements

Before beginning the studies, one of the following conditions for admission must be fulfilled: -General Higher Education Entrance Qualification -Specialised Higher Education Entrance Qualification -General Higher Education Entrance Qualification for Universities of Applied Sciences
-University Administered Entrance Exam
-A qualification for entrance to higher education deemed equivalent by the

Land Saxony-Anhalt.

4. CONTENTS AND RESULTS GAINED

4.1 Mode of Study

Full-time, on-campus programme

4.2 Programme learning outcomes

Graduates of the study programme „Smart Automation-Automation Technology” are experts of distributed automation systems and of electrical drive systems for motion control. They design manufacturing sequences according to the company’s specific requirements, compose and develop associated core components and peripheral facilities, consequently.

Engineering competence:

Graduates have a broad overview on pertinent fundamentals in physics, mathematics, and electrical engineering. On that grounds, they identify and tackle issues related to the automation and improvement of manufacturing facilities, independently. They trace and assess specific properties of automatic and process control systems. The graduates have expert know-how of the application, coding and operation of industrial robots. They have a basic understanding of industrial communication systems to which production data feed in. They design and optimize tri-dimensional constructions using adequate CAD and CAE tools.

IT competence:

Graduates are familiar with simple and structured data categories, and with the JAVA procedures. They know how to work in an integrated development environment and how to apply the methods of imperative programming using C/C++. They have a solid understanding of industrial communication systems where production data feed in, and of the benefits and limits of capabilities of those systems. They use micro-computers to determine and optimize process-related measurements by actors and sensors.

Technical Competence:

Graduates collaborate with manufacturing and process engineers on the appropriate connection of process control components and hardware. They agree on technical requirements of electrical drives, industrial and automatic control concepts. To ensure the proper software connection of developed hardware components, they cooperate with computational engineers, closely.

General Management competence

The graduates know the terminology, principles and theories of business administration. They have a basic understanding of general business processes, functions, operations and interdependencies. They are aware of general economic principles and management issues.

Methodical Competence:

Graduates analyse relevant issues, identify arising needs for action and suggest measures to overcome problems taking

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into consideration recent technical developments as well as economic and ethical aspects. Based on the knowledge on pertinent paradigms and methods, they select and apply appropriate methods and tools, adequately.

Systemic competence:

The graduates combine methodical and expert competences to cope with the complexity of real world issues of distributed automation systems. They gather, evaluate and interpret relevant information in order to derive scientifically sound judgements from that information. They align and adapt approaches to current needs and changing outside conditions.

Personal competence

The graduates present their results, products and findings according to the task assignment and to the target group needs. They assume responsibility in interdisciplinary teams to develop and implement solutions jointly. They act independently in working and learning environments, and enlarge their knowledge and skills, constantly. In doing so, they reflect on the economic, social and cultural impact of their objectives and actions.

The graduate has completed the following professional field orientations:

Mechatronics:

Graduates draft, develop and engineer sensor and actuator supported automatic control concepts for electrical drives and motion processes, independently. They model, test and optimize the workflow of those by using common simulation methods and techniques. They use the ANSYS programming in order to reprocess signal and process data in connected information systems, reliably.

Smart Home / Smart City:

Graduates have a broad overview on current systems of buildings' automation. From a variety of systems, they select the appropriate option(s) for a defined scenario and adapt it by programming according to the specific requirements. They take into account aspects of energy and cost efficiency resulting from the use of conventionally generated and renewable electrical energy. They elaborate concepts for data security management, for evaluation of digitized processes and web services of companies and public administrations.

Internet of Things:

Graduates programme mobile applications for Android smartphone operating systems, graphical user interfaces, sensors and GPS data visualisations. Furthermore, they programme applications for navigating and localising mobile robotic and multi-agent systems. They develop driver software as loadable kernel modules used in individual Linux systems and configure simple hardware interfaces for coupling with external components.

Renewable Energy Systems:

Graduates decide on the efficient use of renewable energy sources in accordance to local conditions. They evaluate producer and consumer energy profiles, and cross-link existing decentralised energy sources. They have a broad overview on the process engineering of solar energy, wind and water power. Graduates are familiar with the main components of energy conversion coming from renewable energy sources to be stored in appropriate storage facilities in order to counterbalance fluctuating energy supply and demand. They design electrochemical storage systems and pre-calculate associated components, appropriately.

Smart Factory:

Graduates perform technical control tasks of process and manufacturing automation, independently. For this, they use diverse types of process and operation control systems. Based on usual industrial human-machine communication protocols and software interfaces, they design the data exchange and data processing according specified requirements. They implement digital concepts of automatic control and communication interfaces using C/C++ and Java based socket programming, message-oriented middle ware and embedded web servers.

Smart Devices:

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Graduates use, compile and integrate electronic components and circuits taking into consideration specific circuit parameters and measurement equipment. They master machine coding in Assembler and C programming language using latest software development tools such as Tasking, PLS and DAVE, efficiently. They deploy micro controllers and peripheral components in applications according to the required specifications. To embed digital signal processors into applications and complex circuits, they use usual hardware description languages such as ABEL, VHDL and Verilog.

Hans Mustermann**4.3 Programme details, individual credits gained and grades/marks obtained**

Courses taken	Grade	Performance Appraisal	ECTS credits
Mathematics I	2,0	good	7,5
Physics I	2,3	good	5
Digital Fundamentals	2,0	good	5
Introduction to Computer Science	2,0	good	2,5
Technical English	1,7	good	5
Introduction to Smart Automation	2,0	good	5
Programme and Data Structures	2,3	good	
Mathematics II	2,3	good	10
Physics II	2,3	good	5
Electrical Engineering I	2,0	good	5
Introduction to Business Administration	2,3	good	2,5
Electrical Engineering II	2,3	good	5
Microcomputer Structures	2,3	good	5
Measurement, Sensors and Actuators	2,3	good	5
Quality Management	2,3	good	5
Mechatronics	1,7	good	5
Programming in C/C++	1,7	good	5
Industrial Communication Systems	1,7	good	5
Industrial Control	1,7	good	5

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4.3 Programme details, individual credits gained and grades/marks obtained

Courses taken	Grade	Performance Appraisal	ECTS credits
Automatic Control	1,7	good	5
Project	1,7	good	5
Computer Aided Engineering	2,3	good	5
Electronic Energy Conversion	2,0	good	5
Process Control	2,0	good	5
Electives	1,7	good	5
Team Project	1,7	good	5
Professional Field Orientation: Mechatronics	2,3	good	
Professional Field Orientation: Smart Home and Smart City	1,7	good	
Specialisation: Internet of Things	2,0	good	
Professional Field Orientation: Renewable Energies	2,3	good	
Professional Field Orientation: Smart Factory	1,7	good	
Professional Field Orientation: Smart Devices	2,0	good	
Work Placement		passed	15
Colloquium	1,7	good	3
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Bachelor Thesis	2,0	good	12
Theme: Hier steht dann der Titel der Bachelor- bzw. Masterarbeit			
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Total ECTS credit points			210

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4.4 Grading Scheme and Grade Distribution of Overall Performances

The distribution of grades for overall performances has been calculated based on the overall performance results in this programme of study since its opening (2015).

Number of Graduates: 123

HS Harz grade	Performance	Performance appraisal	Performance appreciation	Grade Distribution	Cumulation
1,0	95 - 100 %	Very good	An excellent performance	10 %	10 %
to 1,3	90 - 94 %			5 %	15 %
to 1,7	85 - 89 %	Good	A performance significantly above average standard	7 %	22 %
to 2,0	80 - 84 %			10 %	32 %
to 2,3	76 - 79 %			18 %	50 %
to 2,7	72 - 75 %	Satisfactory	An average performance	15 %	65 %
to 3,0	68 - 71 %			13 %	78 %
to 3,3	63 - 67 %			12 %	90 %
to 3,7	58 - 62 %	Sufficient	A performance which meets minimum requirements despite of shortcomings	8 %	98 %
to 4,0	50 - 57 %			2 %	100 %

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4.5 Overall Classification of the qualification (in original language)

gut (2,0)

At degree awarding date, this overall performance was among the best 50 % referring to 123 graduates of this study programme since its opening (2015).

5. INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Access to Further Study

The graduate of the field of study Automation has attained the ability to study further in programs at the level of a Master's degree.

Due to his / her comprehensive education in electrical engineering studies, he / she can be recommended for the admission to electrical engineering courses of study as well as to master degree programs with a main focus on automation systems.

5.2 Access to regulated professions

n/a

6. ADDITIONAL INFORMATION

6.1 Additional Information

6.2 Further Information Sources

www.hs-harz.de/studium/fb-automatisierung-und-informatik/automatisierungstechnik-und-ingenieur-informatik/

+49 3943 659 300

7. CERTIFICATION

This Diploma Supplement refers to the following original documents:

Urkunde über die Verleihung des Grades issued on 12.06.2020

Prüfungszeugnis issued on 12.06.2020

Transcript of Records issued on 12.06.2020

Certification Date: 2020-06-12

Chairperson Examination Committee

8. NATIONAL HIGHER EDUCATION SYSTEM

The information on the national higher education system on the following pages provides a context for the qualification and the type of higher education that awarded it.

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8. INFORMATION ON THE GERMAN HIGHER EDUCATION SYSTEM [1]

8.1 Types of Institutions and Institutional Status

Higher education (HE) studies in Germany are offered at three types of Higher Education Institutions (HEI).[2]

- Universitäten (Universities) including various specialised institutions, offer the whole range of academic disciplines. In the German tradition, universities focus in particular on basic research so that advanced stages of study have mainly theoretical orientation and research-oriented components.

- Fachhochschulen (FH)/Hochschulen für Angewandte Wissenschaften (HAW) (Universities of Applied Sciences, UAS) concentrate their study programmes in engineering and other technical disciplines, business-related studies, social work, and design areas. The common mission of applied research and development implies an application-oriented focus of studies, which includes integrated and supervised work assignments in industry, enterprises or other relevant institutions.

- Kunst- und Musikhochschulen (Universities of Art/Music) offer studies for artistic careers in fine arts, performing arts and music; in such fields as directing, production, writing in theatre, film, and other media; and in a variety of design areas, architecture, media and communication.

Higher Education Institutions are either state or state-recognised institutions. In their operations, including the organisation of studies and the designation and award of degrees, they are both subject to higher education legislation.

8.2 Types of Programmes and Degrees Awarded

Studies in all three types of institutions have traditionally been offered in integrated "long" (one-tier) programmes leading to Diplom- or Magister Artium degrees or completed by a Staatsprüfung (State Examination).

Within the framework of the Bologna-Process one-tier study programmes are successively being replaced by a two-tier study system. Since 1998, two-tier degrees (Bachelor's and Master's) have been introduced in almost all study programmes. This change is designed to enlarge variety and flexibility for students in planning and pursuing educational objectives; it also enhances international compatibility of studies.

The German Qualifications Framework for Higher Education Qualifications (HQR)[3] describes the qualification levels as well as the resulting qualifications and competences of the graduates. The three levels of the HQR correspond to the levels 6, 7 and 8 of the German Qualifications Framework for Lifelong Learning [4] and the European Qualifications Framework for Lifelong Learning [5].

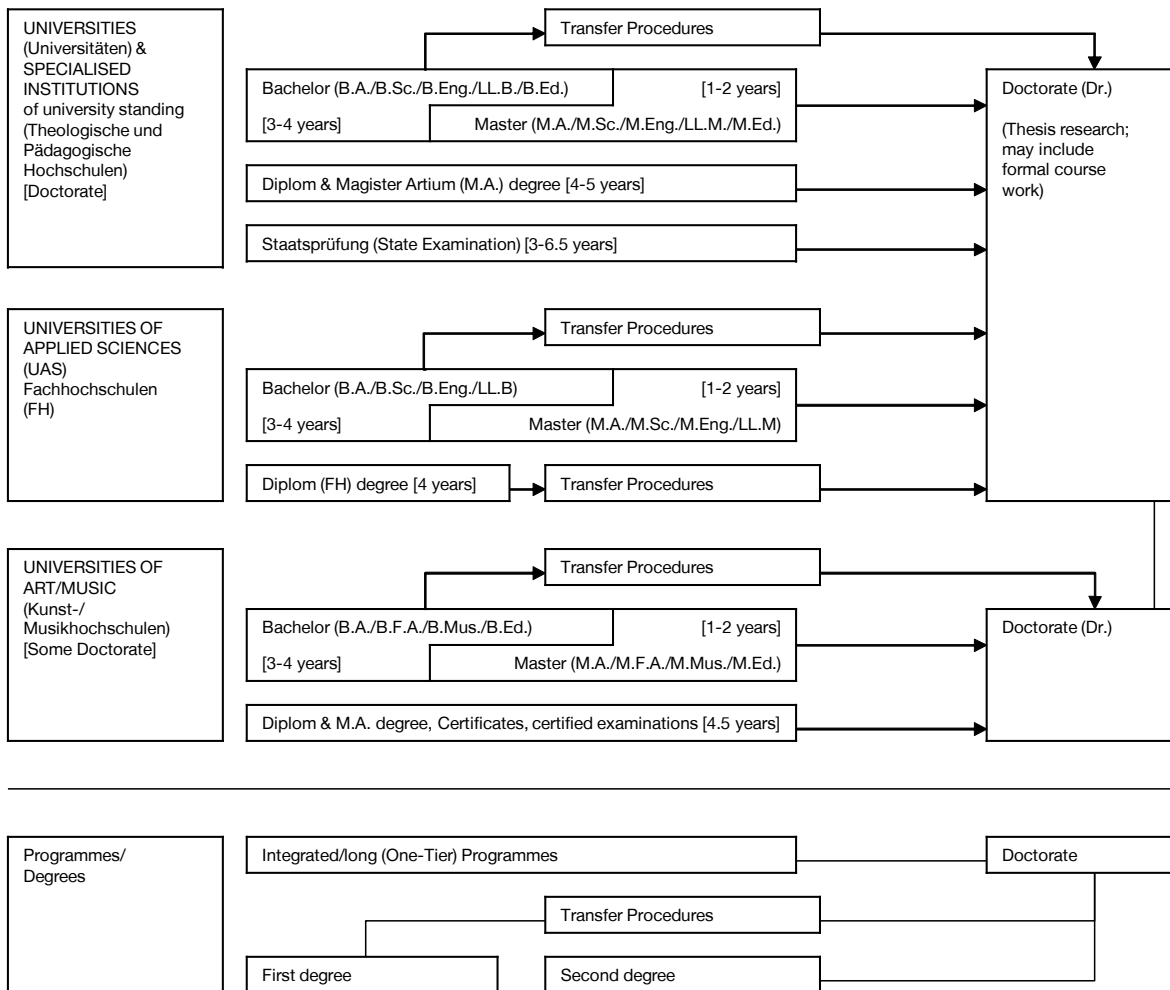
For details cf. Sec. 8.4.1, 8.4.2, and 8.4.3 respectively. Table 1 provides a synoptic summary.

8.3 Approval/Accreditation of Programmes and Degrees

To ensure quality and comparability of qualifications, the organisation of studies and general degree requirements have to conform to principles and regulations established by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (KMK).[6] In 1999, a system of accreditation for Bachelor's and Master's programmes has become operational. All new programmes have to be accredited under this scheme; after a successful accreditation they receive the seal of the Accreditation Council.[7]

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Table 1:
Institutions, Programmes and Degrees in German Higher Education



8.4 Organization and Structure of Studies

The following programmes apply to all three types of institutions. Bachelor’s and Master’s study programmes may be studied consecutively, at various higher education institutions, at different types of higher education institutions and with phases of professional work between the first and the second qualification. The organisation of the study programmes makes use of modular components and of the European Credit Transfer and Accumulation System (ECTS) with 30 credits corresponding to one semester.

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8.4.1 Bachelor

Bachelor's degree programmes lay the academic foundations, provide methodological competences and include skills related to the professional field. The Bachelor's degree is awarded after 3 to 4 years.

The Bachelor's degree programme includes a thesis requirement. Study programmes leading to the Bachelor's degree must be accredited according to the Interstate study accreditation treaty.[8]

First degree programmes (Bachelor) lead to Bachelor of Arts (B.A.), Bachelor of Science (B.Sc.), Bachelor of Engineering (B.Eng.), Bachelor of Laws (LL.B.), Bachelor of Fine Arts (B.F.A.), Bachelor of Music (B.Mus.) or Bachelor of Education (B.Ed.).

The Bachelor's degree corresponds to level 6 of the German Qualifications Framework/ European Qualifications Framework.

8.4.2 Master

Master is the second degree after another 1 to 2 years. Master's programmes may be differentiated by the profile types "practice-oriented" and "research-oriented". Higher Education Institutions define the profile.

The Master's degree programme includes a thesis requirement. Study programmes leading to the Master's degree must be accredited according to the Interstate study accreditation treaty.[9]

Second degree programmes (Master) lead to Master of Arts (M.A.), Master of Science (M.Sc.), Master of Engineering (M.Eng.), Master of Laws (L.L.M.), Master of Fine Arts (M.F.A.), Master of Music (M.Mus.) or Master of Education (M.Ed.). Master's programmes which are designed for continuing education may carry other designations (e.g. MBA).

The Master's degree corresponds to level 7 of the German Qualifications Framework/ European Qualifications Framework.

8.4.3 Integrated "Long" Programmes (One-Tier): Diplom degrees, Magister Artium, Staatsprüfung

An integrated study programme is either mono-disciplinary (Diplom degrees, most programmes completed by a Staatsprüfung) or comprises a combination of either two major or one major and two minor fields (Magister Artium). The first stage (1.5 to 2 years) focuses on broad orientations and foundations of the field(s) of study. An Intermediate Examination (Diplom-Vorprüfung for Diplom degrees; Zwischenprüfung or credit requirements for the Magister Artium) is prerequisite to enter the second stage of advanced studies and specialisations. Degree requirements include submission of a thesis (up to 6 months duration) and comprehensive final written and oral examinations. Similar regulations apply to studies leading to a Staatsprüfung. The level of qualification is equivalent to the Master's level.

- Integrated studies at Universitäten (U) last 4 to 5 years (Diplom degree, Magister Artium) or 3.5 to 6.5 years (Staatsprüfung). The Diplom degree is awarded in engineering disciplines, the natural sciences as well as economics and business. In the humanities, the corresponding degree is usually the Magister Artium (M.A.). In the social sciences, the practice varies as a matter of institutional traditions. Studies preparing for the legal, medical and pharmaceutical professions are completed by a Staatsprüfung. This applies also to studies preparing for teaching professions of some Länder.

The three qualifications (Diplom, Magister Artium and Staatsprüfung) are academically equivalent and correspond to level 7 of the German Qualifications Framework/European Qualifications Framework.

They qualify to apply for admission to doctoral studies. Further prerequisites for admission may be defined by the Higher Education Institution, cf. Sec. 8.5.

- Integrated studies at Fachhochschulen (FH)/Hochschulen für Angewandte Wissenschaften (HAW) (Universities of Applied Sciences, UAS) last 4 years and lead to a Diplom (FH) degree which corresponds to level 6 of the German Qualifications Framework/European Qualifications Framework.

Qualified graduates of FH/HAW/UAS may apply for admission to doctoral studies at doctorate-granting institutions, cf. Sec. 8.5.

- Studies at Kunst- and Musikhochschulen (Universities of Art/Music etc.) are more diverse in their organisation, depending on the field and individual objectives. In addition to Diplom/Magister degrees, the integrated study programme awards include certificates and certified examinations for specialised areas and professional purposes.

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8.5 Doctorate

Universities as well as specialised institutions of university standing, some of the FH/HAW/UAS and some Universities of Art/Music are doctorate-granting institutions. Formal prerequisite for admission to doctoral work is a qualified Master's degree (UAS and U), a Magister degree, a Diplom, a Staatsprüfung, or a foreign equivalent. Comparable degrees from universities of art and music can in exceptional cases (study programmes such as music theory, musicology, pedagogy of arts and music, media studies) also formally qualify for doctoral work. Particularly qualified holders of a Bachelor's degree or a Diplom (FH) degree may also be admitted to doctoral studies without acquisition of a further degree by means of a procedure to determine their aptitude. The universities respectively the doctorate-granting institutions regulate entry to a doctorate as well as the structure of the procedure to determine aptitude. Admission further requires the acceptance of the Dissertation research project by a professor as a supervisor.

The doctoral degree corresponds to level 8 of the German Qualifications Framework/ European Qualifications Framework.

8.6 Grading Scheme

The grading scheme in Germany usually comprises five levels (with numerical equivalents; intermediate grades may be given): "Sehr Gut" (1) = Very Good; "Gut" (2) = Good; "Befriedigend" (3) = Satisfactory; "Ausreichend" (4) = Sufficient; "Nicht ausreichend" (5) = Non-Sufficient/Fail. The minimum passing grade is "Ausreichend" (4). Verbal designations of grades may vary in some cases and for doctoral degrees.

In addition, grade distribution tables as described in the ECTS Users' Guide are used to indicate the relative distribution of grades within a reference group.

8.7 Access to Higher Education

The General Higher Education Entrance Qualification (Allgemeine Hochschulreife, Abitur) after 12 to 13 years of schooling allows for admission to all higher educational studies. Specialised variants (Fachgebundene Hochschulreife) allow for admission at Fachhochschulen (FH)/Hochschulen für Angewandte Wissenschaften (HAW) (UAS), universities and equivalent higher education institutions, but only in particular disciplines. Access to study programmes at Fachhochschulen (FH)/Hochschulen für Angewandte Wissenschaften (HAW) (UAS) is also possible with a Fachhochschulreife, which can usually be acquired after 12 years of schooling. Admission to study programmes at Universities of Art/Music and comparable study programmes at other higher education institutions as well as admission to a study programme in sports may be based on other or additional evidence demonstrating individual aptitude. Applicants with a qualification in vocational education and training but without a school-based higher education entrance qualification are entitled to a general higher education entrance qualification and thus to access to all study programmes, provided they have obtained advanced further training certificates in particular state-regulated vocational fields (e.g. Meister/Meisterin im Handwerk, Industriemeister/in, Fachwirt/in (IHK), Betriebswirt/in (IHK) und (HWK), staatlich geprüfte/r Techniker/in, staatlich geprüfte/r Betriebswirt/in, staatlich geprüfte/r Gestalter/in, staatlich geprüfte/r Erzieher/in). Vocationally qualified applicants can obtain a Fachgebundene Hochschulreife after completing a state-regulated vocational education of at least two years' duration plus professional practice of normally at least three years' duration, after having successfully passed an aptitude test at a higher education institution or other state institution; the aptitude test may be replaced by successfully completed trial studies of at least one year's duration.[10]

Higher Education Institutions may in certain cases apply additional admission procedures.

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- Kultusministerkonferenz (KMK) [Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany]; Graurheindorfer Str. 157, D-53117 Bonn; Phone: +49[0]228/501-0; www.kmk.org; E-Mail: hochschulen@kmk.org
- Central Office for Foreign Education (ZAB) as German NARIC; www.kmk.org; E-Mail: zab@kmk.org
- German information office of the Länder in the EURYDICE Network, providing the national dossier on the education system; www.kmk.org; E-Mail: Eurydice@kmk.org
- Hochschulrektorenkonferenz (HRK) [German Rectors' Conference]; Leipziger Platz 11, D-10117 Berlin, Phone: +49 30 206292-11; www.hrk.de; E-Mail: post@hrk.de
- "Higher Education Compass" of the German Rectors' Conference features comprehensive information on institutions, programmes of study, etc. (www.higher-education-compass.de)

[1] The information covers only aspects directly relevant to purposes of the Diploma Supplement.

[2] Berufsakademien are not considered as Higher Education Institutions, they only exist in some of the Länder. They offer educational programmes in close cooperation with private companies. Students receive a formal degree and carry out an apprenticeship at the company. Some Berufsakademien offer Bachelor courses which are recognised as an academic degree if they are accredited by the Accreditation Council.

[3] German Qualifications Framework for Higher Education Degrees. (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 16 February 2017).

[4] German Qualifications Framework for Lifelong Learning (DQR). Joint resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany, the German Federal Ministry of Education and Research, the German Conference of Economics Ministers and the German Federal Ministry of Economics and Technology (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 15 November 2012). More information at www.dqr.de

[5] Recommendation of the European Parliament and the European Council on the establishment of a European Qualifications Framework for Lifelong Learning of 23 April 2008 (2008/C 111/01 – European Qualifications Framework for Lifelong Learning – EQF).

[6] Specimen decree pursuant to Article 4, paragraphs 1 – 4 of the interstate study accreditation treaty (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 7 December 2017).

[7] Interstate Treaty on the organization of a joint accreditation system to ensure the quality of teaching and learning at German higher education institutions (Interstate study accreditation treaty) (Decision of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 8 December 2016), Enacted on 1 January 2018.

[8] See note No. 7.

[9] See note No. 7.

[10] Access to higher education for applicants with a vocational qualification, but without a school-based higher education entrance qualification (Resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany of 6 March 2009).