Diploma Supplement

The purpose of this Diploma Supplement is to explain the Bachelor-Urkunde, the Bachelor-Zeugnis and the Transcript provided by Mannheim University of Applied Sciences. The contents conform to the standard given by the Hochschulrektorenkonferenz (HRK), the association of state and state-recognised universities and other higher education institutions in Germany.

1. HOLDER OF THE QUALIFICATION

The holder of the qualification is shown on the Bachelor-Zeugnis.

2. QUALIFICATION

<table>
<thead>
<tr>
<th>Name of Qualification:</th>
<th>Bachelor of Science (B.Sc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Field(s) of Study:</td>
<td>Automation Technology</td>
</tr>
<tr>
<td>Institution Awarding the Qualification:</td>
<td>Mannheim University of Applied Sciences / Hochschule Mannheim</td>
</tr>
<tr>
<td>Status:</td>
<td>Fachhochschule / University of Applied Sciences</td>
</tr>
<tr>
<td>Institution Administering Studies:</td>
<td>Mannheim University of Applied Sciences / Hochschule Mannheim</td>
</tr>
<tr>
<td>Status:</td>
<td>Fachhochschule / University of Applied Sciences</td>
</tr>
<tr>
<td>Languages of Instruction/Examination:</td>
<td>German, English (optional in the first year)</td>
</tr>
</tbody>
</table>

3. LEVEL OF THE QUALIFICATION

Level
Bachelor graduate, first degree (3½ years) with research project

Official Length of Programme
3½ years including 3 month research project

Access Requirements
Non-German speaking students who are eligible to attend university in their home country are admitted according to German regulations

4. CONTENTS AND RESULTS GAINED

Mode of Study
Full-time

Programme Requirements / Qualification Profile of the Graduate
The programme is structured into 2 semester basic study and 5 semester main study including a work experience semester and the Bachelor thesis.
<table>
<thead>
<tr>
<th>Semester</th>
<th>Main Study</th>
<th>Basic Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th Semester</td>
<td>incl. Bachelor Thesis</td>
<td></td>
</tr>
<tr>
<td>6th Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Semester</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Learning is based on a combination of theoretical knowledge and practical experience. The aims are to provide students the opportunity to acquire the knowledge base, professional awareness, critical faculty, interpretative and communicative skills and ethical responsibility expected of informed professionals working within specialist.

The final academic year allows specialisation in different areas of interest. In studying Automation Technology at Mannheim University of Applied Sciences, the students benefit from a practically-oriented curriculum, close contacts to local industry and a wide choice of projects. The laboratories have state of the art equipment and provide contact with professional life.

Programme Components and Details
The programme consists of the following modules:

**Mathematics:**
- Calculus
- Multivariable Calculus and Series

**Physics:**
- Mechanics and Vibrations
- Thermodynamics and Waves

**Electrical Engineering:**
- Analysis of Electric DC- and AC-Circuits
- Single and Polyphase Systems
- Electric and Magnetic Fields

**Introduction to Electronics:**
- Electronic Components and Circuits

**Computing:**
- Programming in C
- Introduction to Object-Oriented Programming in C++

**Electives Interdisciplinary Competences:**
(Two modules have to be elected)
- Language
- Methods of Scientific Work
- Business Administration
- Business Law

**System Theory:**
- Differential Equations, Linear Algebra, Numerics
- Mathematical Description of Continuous and Discrete Systems

**Measurement and Instrumentation:**
- Industrial Sensors
- Microelectronics
- Power Electronics
- Digital Electronics

**Electronics:**
-
Electric Machines and Drives:  - DC-Machines and Rotation Field Machines  - Electric Drives

Elective Power Engineering:  (One module has to be elected)  - Regenerative Energies: Components and Applications  - Energy Systems and Power Machines

Microcomputers:  - Hardware-Oriented Programming of Microcomputers  - Analogue and Digital Signal Processing

Closed-Loop Control Systems:  - Introduction to Feedback Control Systems  - Digital Feedback Control Systems  - Modelling and Simulation of Dynamic Systems

Open-Loop Control Systems:  - System and Program Design for Programmable Logic Controls  - Motion Controls: Automation of Manufacturing Processes


Elective Engineering Sciences:  (One module has to be elected)  - Building Automation  - Modelling and Simulation of Mechatronic Systems  - Applied Circuit Technology  - Power Engineering in the Energy Supply Industry

Practical Semester:  - Internship  - Key Competences Seminar  - Practical Semester Colloquium

Student Research Project:  - Student Research Project  - Research Project Seminar

Final Examination:  - Bachelor Thesis Colloquium

Bachelor Thesis:  - Bachelor Thesis

Further details are listed on the back side of the Bachelor-Zeugnis.

Grading Scheme
Grading system: 1.0 – 1.5 (very good); 1.6 – 2.5 (good); 2.6 – 3.5 (satisfactory); 3.6 – 4.0 (sufficient); 4.1 – 5.0 (fail).
In some courses only a pass or fail are awarded.

Overall Classification
The overall classification is shown on the Bachelor-Zeugnis. It is based on written assessments every semester during main study and a Bachelor thesis.
The course grades and the Bachelor thesis are weighted to calculate the final grade.
The course grades for the basic study are shown in a separated transcript called Bachelorvorprüfungs-Zeugnis.
Grading Scheme and Grade Distribution for the Overall Classification

<table>
<thead>
<tr>
<th>Grades</th>
<th>Graduates (01/16-12/18)</th>
<th>abs. No.</th>
<th>%**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,0 - 1,2*</td>
<td>very good</td>
<td>2</td>
<td>2,4%</td>
</tr>
<tr>
<td>1,3 - 1,5</td>
<td></td>
<td>6</td>
<td>7,1%</td>
</tr>
<tr>
<td>1,6 - 1,8</td>
<td>good</td>
<td>11</td>
<td>12,9%</td>
</tr>
<tr>
<td>1,9 - 2,2</td>
<td></td>
<td>18</td>
<td>21,2%</td>
</tr>
<tr>
<td>2,3 - 2,5</td>
<td></td>
<td>19</td>
<td>22,4%</td>
</tr>
<tr>
<td>2,6 - 2,8</td>
<td>satisfactory</td>
<td>19</td>
<td>22,4%</td>
</tr>
<tr>
<td>2,9 - 3,2</td>
<td></td>
<td>10</td>
<td>11,8%</td>
</tr>
<tr>
<td>3,3 - 3,5</td>
<td></td>
<td>0</td>
<td>0,0%</td>
</tr>
<tr>
<td>3,6 - 3,8</td>
<td>sufficient</td>
<td>0</td>
<td>0,0%</td>
</tr>
<tr>
<td>3,9 - 4,0</td>
<td></td>
<td>0</td>
<td>0,0%</td>
</tr>
<tr>
<td>Ø** 2,2</td>
<td></td>
<td>85</td>
<td>100%</td>
</tr>
</tbody>
</table>

* with distinction

** calculated only if at least 20 students finished the programme within the given timeframe

5. FUNCTION OF THE QUALIFICATION

Access to Further Study
The degree corresponds to the first cycle degree according to the new European Higher Education System (Bologna Declaration) and qualifies the holder to apply for a second cycle degree.

Professional Status
The holder is qualified to work as an engineer in the field of electrical engineering and automation.

6. ADDITIONAL INFORMATION

Further Information Sources
a) on the institution, the programme and the accreditation: www.hs-mannheim.de
b) on the department: www.et.hs-mannheim.de
c) description of course contents available on request
d) for national information sources cf. sect. 8.8
7. CERTIFICATION

This diploma supplement refers to the following original documents, issued by Hochschule Mannheim:

Bachelor-Urkunde
Bachelor-Zeugnis
Transcript

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.
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 specialized 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 (Universities of Applied Sciences) 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-recognized institutions. In their operations, including the organization 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 and Master) have been introduced in almost all study programmes. This change is designed to provide enlarged variety and flexibility to students in planning and pursuing educational objectives, they also enhance international compatibility of studies.

The German Qualifications Framework for Higher Education Degrees 3, the German Qualifications Framework for Lifelong Learning 4 and the European Qualifications Framework for Lifelong Learning 5 describe the degrees of the German Higher Education System. They contain the classification of the qualification levels as well as the resulting qualifications and competencies of the graduates.

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 organization 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 programmes of study has become operational under the control of an Accreditation Council. 7

---

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 courses 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 organization 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.

8.4.1 Bachelor

Bachelor degree study programmes lay the academic foundations, provide methodology skills and lead to qualifications related to the professional field. The Bachelor degree is awarded after 3 to 4 years. The Bachelor degree programme includes a thesis requirement. Study courses leading to the Bachelor degree must be accredited according to the Law establishing a Foundation for the Accreditation of Study Programmes in Germany.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 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 study programmes may be differentiated by the profile types “practice-oriented” and “research-oriented”. Higher Education Institutions define the profile.

The Master degree study programme includes a thesis requirement. Study programmes leading to the Master degree must be accredited according to the Law establishing a Foundation for the Accreditation of Study Programmes in Germany.8

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

The Master 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 specializations. 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 level.

- Integrated studies at Universitäten (U) last 4 to 5 years (Diplom degree, Magister Artium) or 3 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)/Universities of Applied Sciences (UAS) last 4 years and lead to a Diplom (FH) degree which corresponds level 6 of the German Qualifications Framework/ European Qualifications Framework.

- While the FH/UAS are non-doctorate granting institutions, qualified graduates 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 organization, depending on the field and individual objectives. In addition to Diplom/Musikpraktiker degrees, the integrated study programme awards include Certificates and certified examinations for specialized areas and professional purposes.

8.5 Doctorate

Universities as well as specialized institutions of university standing and some Universities of Art/Music are doctorate-granting institutions. Formal prerequisite for admission to doctoral work is a completed Master (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 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 and corresponding to level 7 of the German Qualifications Framework/ European Qualifications Framework).

- "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. Specialized variants (Fachgebundenen Hochschulreife, Fachhochschulreife) allow for admission at Fachhochschulen (UAS), universities and equivalent higher education institutions, but only in particular disciplines.

Access to study programmes at Fachhochschulen (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 vocational qualification 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 in Handwerk, Industrieunternehmen, Fachhochschule (FH) and HKW, staatlich geprüfte/ geprüfte Gestalter/in, staatlich geprüfte/ geprüfte Erzieher/in). Vocationally qualified applicants can obtain a Fachhochschulreife 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.

8.8 National Sources of Information

- Kultusministerkonferenz ([KMK] [Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany]); Grauherrnstr. 157, D-53175 Bonn; Fax: +49(0)228/501-777; Phone: +49(0)228/501-0
- Central Office for Foreign Education (ZAB) as German NARIC; www.kmk.org; E-Mail: zabo@mk1.org
- "Documentation and Information Service Germany" as the EURYDICE-Unit, providing the national dossier on the education system (http://www.kmk.org/dokumentation/zusammenarbeit-auf-europaischem-benein-erydice-informationsdienst.html)

1 The information covers only aspects directly relevant to purposes of the Diploma Supplement. All information as of January 2015.
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 recognized as an academic degree if they are accredited by a German accreditation agency.


See note No. 7.

See note No. 7.

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).