Diploma Supplement

The function of this Diploma Supplement is to elaborate on the information provided by the Bachelor-Urkunde (graduation certificate) and the Bachelor-Zeugnis (transcript) awarded 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

Name of Qualification: Bachelor of Science (B.Sc.)
Main Field(s) of Study: Medical Informatics
Institution Awarding the Qualification: Mannheim University of Applied Sciences / Hochschule Mannheim
Status: Fachhochschule / University of Applied Sciences
Institution Administering Studies: Mannheim University of Applied Sciences / Hochschule Mannheim
Status: Fachhochschule / University of Applied Sciences
Languages of Instruction/Examination: German

3. LEVEL OF THE QUALIFICATION

Level
Bachelor graduate, first degree (3½ years) with thesis

Official Length of Programme
3½ years including 3-month thesis

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>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>7th Semester</td>
<td>incl. Bachelor Thesis</td>
</tr>
<tr>
<td>6th Semester</td>
<td>Main Study 150 Credits</td>
</tr>
<tr>
<td>5th Semester</td>
<td>Practical Term</td>
</tr>
<tr>
<td>4th Semester</td>
<td></td>
</tr>
<tr>
<td>3rd Semester</td>
<td></td>
</tr>
<tr>
<td>2nd Semester</td>
<td>Basic Study 60 Credits</td>
</tr>
<tr>
<td>1st Semester</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 specific areas of academic crosstalk between medicine and computer science.

The final academic year allows specialisation in different areas of medical applications.

In studying Computer Science 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**

- **Foundation courses (basic studies)**
  - Introduction to Computer Science
  - Programming 1
  - Math for Computer Scientists 1
  - Medical Informatics 1
  - Medicine 1
  - Software Engineering 1
  - Programming 2
  - Math for Computer Scientists 2
  - Medical Informatics 2
  - Medicine 2

- **Advanced Courses**
  - Software Engineering 2
  - Data Management
  - Web-based Systems
  - Math for Computer Scientists 3
  - Medical Informatics 3
  - Medical Informatics 4
  - Projects in Medical Informatics
    - Project Management
    - C/C++ Programming
    - Selected Topics in Medical Informatics
- Medical Software Project
  - English
  - Team Building Workshop
  - Medical Software Development Project
- Practical Semester
  - Internship
  - Practical Semester Colloquium
  - Interdisciplinary Competencies
- Distributed Systems
- Research Methods
- Tutorial
- Elective 1 – 7

- Electives
  - Medical Informatics
    - Bioinformatics
    - Digital Image Processing
    - Mathematical Models in Medicine
    - Medical Biometry
    - Medical Documentation
    - Medical Engineering and Imaging Techniques
    - Medical Launch Development
    - Medical Standards
    - Medicine 3
    - Software as Medical Product/Ambient Assisted Living
    - Standards in Medical Informatics
    - Telemedicine
  - Computer Science
    - Agile Software Development
    - Applied Project: Visualization
    - Big Data Engineering & Analysis
    - Business Process Management
    - Challenge-Based Making
    - Coding Theorie
    - Communication Systems
    - Component Software
    - Cryptography
    - Design Patterns for Functional Programming
    - Game Engineering
    - Graph Theory
    - Integration Technology
    - Introduction in Neural Networks
    - Introduction to Information Visualization
    - Large-Scale Software Development
    - Law and Privacy
    - Logic and Formal Languages
    - Machine Learning
    - Microcomputing and Embedded Development
    - Mixed Reality - Virtual, Augmented and Hololens
    - Network Security
    - NoSQL Database Systems
    - Robotics
    - Secure Internet Services
• Bachelor Thesis
  o Independent scientific research project including a thesis defence

**Programme Details**
The programme components and details are listed on the back side of the *Bachelor-Zeugnis*. The English translation can be found on the transcript.

**Grading Scheme for Courses**
Grading system: 1.0 – 1.2 (distinction); 1.3 – 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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>abs. No.</td>
</tr>
<tr>
<td>1,0 - 1,2*</td>
<td>1</td>
</tr>
<tr>
<td>1,3 - 1,5</td>
<td>7</td>
</tr>
<tr>
<td>1,6 - 1,8</td>
<td>13</td>
</tr>
<tr>
<td>1,9 - 2,2</td>
<td>16</td>
</tr>
<tr>
<td>2,3 - 2,5</td>
<td>11</td>
</tr>
<tr>
<td>2,6 - 2,8</td>
<td>8</td>
</tr>
<tr>
<td>2,9 - 3,2</td>
<td>1</td>
</tr>
<tr>
<td>3,3 - 3,5</td>
<td>0</td>
</tr>
<tr>
<td>3,6 - 3,8</td>
<td>0</td>
</tr>
<tr>
<td>3,9 - 4,0</td>
<td>0</td>
</tr>
<tr>
<td>Ø** 2,0</td>
<td>57</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.

6. ADDITIONAL INFORMATION

Further Information Sources
a) on the institution, the programme and the accreditation: www.hs-mannheim.de
b) on the department: www.informatik.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 (graduation certificate)
Bachelor-Zeugnis (transcript)
8. INFORMATION ON THE GERMAN HIGHER EDUCATION SYSTEM

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 a distinct application-oriented focus and professional character of studies, which include 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, a scheme of first- and second-level degree programmes (Bachelor and Master) was introduced to be offered parallel to or instead of integrated "long" programmes. These programmes are designed to provide enlarged variety and flexibility to students in planning and pursuing educational objectives, they also enhance international comparability of studies.

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).² In 1999, a system of accreditation for programmes of study has become operational under the control of an Accreditation Council at national level. All new programmes have to be accredited under this scheme; after a successful accreditation they receive the quality-label of the Accreditation Council.³

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

<table>
<thead>
<tr>
<th>Programmes / Degrees</th>
<th>Transfer Procedures</th>
<th>Bachelor (B.A./B.Sc./B.Eng./LL.B)</th>
<th>[3-4 years]</th>
<th>Master (M.A./M.Sc./M.Eng./LL.M)</th>
<th>[1-2 years]</th>
<th>Staatsprüfung (State Examination)</th>
<th>[3-6.5 years]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITIES OF ART MUSIC (Kunst- und Musikhochschulen) [Some Doctorate]</td>
<td></td>
<td>Bachelor (B.A./B.F.A./B.Mus.)</td>
<td>[3-4 years]</td>
<td>Diplom &amp; M.A. degrees, Certificates, certified examinations [4-5 years]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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² In 1999, a system of accreditation for programmes of study has become operational under the control of an Accreditation Council at national level. All new programmes have to be accredited under this scheme; after a successful accreditation they receive the quality-label of the Accreditation Council.³

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³ 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). In 1999, a system of accreditation for programmes of study has become operational under the control of an Accreditation Council at national level. All new programmes have to be accredited under this scheme; after a successful accreditation they receive the quality-label of the Accreditation Council.
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 methodological 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. 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.) or Bachelor of Music (B.Mus.).

8.4.2 Master

Master is the second degree after another 1 to 2 years. Master study programmes must be differentiated by the profile types “more practice-oriented” and “more research-oriented”. Higher Education Institutions define the profile of each Master study programme. 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.

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.) or Master of Music (M.Mus.). Master study programmes, which are designed for continuing education or which do not build on the preceding Bachelor study programmes in terms of their content, may carry other designations (e.g. MBA).

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, pharmaceutical and teaching professions are completed by a Staatsprüfung.

The three qualifications (Diplom, Magister Artium and Staatsprüfung) are academically equivalent. 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. 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/Magister 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 qualified Master (UAS and U), a Magister degree, a Diplom, a Staatsprüfung, or a foreign equivalent. 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.

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 programmes. In addition institutions may already use the ECTS grading scheme, which operates with the levels A (best 10 %), B (next 25 %), C (next 30 %), D (next 25 %), and E (next 10 %).

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 (Fachgebundene Hochschulreife) allow for admission to particular disciplines. Access to Fachhochschulen (UAS) is also possible with a Fachhochschulreife, which can usually be acquired after 12 years of schooling. Admission to Universities of Art/Music may be based on other or require additional evidence demonstrating individual aptitude. 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]; Lennèstrasse 6, D-53113 Bonn; Phone: +49[0]228/501-229; Fax: +49[0]228/501-510; Phone: +49[0]228/501-510; Phone: +49[0]228/501-510
- Central Office for Foreign Education (Zab) as German NARIC; www.kmk.org; E-Mail: zab@kmk.org
- "Documentation and Educational Information Service" as German EURYDICE Unit, providing the national dossier on the education system (www.kmk.org/doku/bildungswesen.htm); E-Mail: eurydice@kmk.org
- Hochschulerkennungskonferenz (HRK) [German Rectors’ Conference]; Afstrasse 39, D-53175 Bonn; Fax: +49[0]228/887-110; Phone: +49[0]228/887-0; www.hrk.de; E-Mail: sektion@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. All information as of 1 July 2005.
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 recognized as an academic degree if they are accredited by a German accreditation agency.
5 See note No. 4.
6 See note No. 4.