03

Subject-specific criteria of the Technical Committee 03 – Civil Engineering, Geodesy and Architecture

for the accreditation of Bachelor's and Master's degree programmes in the fields of Civil Engineering and Geodesy, Architecture and Interior Design and Urban and Regional Planning

(as of 26 June 2020)

The following statements supplement the ASIIN "General Criteria for the Accreditation of Degree Programmes".

1 Preliminary note

1.1 Function and context

The Subject-Specific Criteria (SSC) of the Technical Committee 03 - Civil Engineering, Geodesy and Architecture are based on the condition, that the higher education institution has defined the indented learning outcomes for the study programmes submitted for accreditation in accordance with their higher education profile on their own responsibility. These intended learning outcomes represent the main background against which to evaluate the curricula of the study programmes.

In addition, the Subject-Specific Criteria of each ASIIN Technical Committee fulfil a number of important functions:

The SSC are the result of a regular assessment by the responsible ASIIN Technical Committee, to summarise the opinion of academia and professionals on the current standards in higher education and the future education demands on the labour market. Therefore, the expectations stated in the SSC regarding the achievement of study objectives, learning outcomes and competence profiles are not static. Rather, they are subject to constant review in close cooperation with organisations of the professional community of the respective field, such as associations of faculties and departments, professional societies and associations of professional practice.

The SSC help applying higher education institutions to critically reflect on the coherence of their own learning outcomes, curricula and related quality expectations and to evaluate their standing with respect to their own goals.

During the accreditation procedure, the SSC also represent a technically elaborated basis for the discussion among experts, higher education institutions and committees of ASIIN. They thus make an important contribution to the comparability of national and international accreditation procedures and ensure that the experts address identical technical parameters in each accreditation procedure. At the same time, the SSC specify the abilities, skills and competences classified as the current "state of the art" in a subject area, which, however, might be exceeded and adapted if this is required to meet the indented objectives of a study programme.

1.2 Scope and consistency with other technical criteria

These SSC are a continuation and revision of the previous version, which was adopted on 9 December 2011. They are consistent with the *EUR-ACE® Framework Standards and Guidelines* (in the version of 31 March 2015) of the *European Network for Accreditation of Engineering Education (ENAEE)*, an association of European stakeholders for the review and qualitative development of engineering degree programmes.

In addition, with regard to civil engineering, the SSC were developed in accordance with the *Referenzrahmen für Studiengänge des Bauingenieurwesens 2018 (2018 Reference Framework for Civil Engineering Study Programmes)* of the *Akkreditierungsverbund für Studiengänge des Bauingenieurwesens (ASBau)*, an association of German universities, trade associations and state institutions involved in civil engineering.

In the field of geodesy, the *Fachspezifische Qualifikationsrahmen Geodäsie und Geoinformation (FQR_GG, subject-specific qualification framework for geodesy and geoinformation) as* of November 2018 was taken into account. The following institutions were involved in its development: The Bavarian Academy of Sciences and Humanities, the Fachbereichstag Geoinformation, Vermessung und Kartographie (FGVK), the Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder (AdV), the Arbeitsgemeinschaft Nachhaltige Landentwicklung, the Bund der Öffentlich bestellten Vermessungsingenieure (BDVI), the Gesellschaft für Geodäsie, Geoinformation und Landmanagement (DVW), the Verband Deutscher Vermessungsingenieure (VDV) and the Bundesingenieurkammer (BIngK).

For architecture, the SSC are based on the *Fachliche Kriterien für die Akkreditierung von Studiengängen 2018 (2018 Subject Criteria for the Accreditation of Degree Programmes)* and the *Qualifikationsrahmen Architektur 2016 (2016 Architecture Qualifications Framework)* of the *Akkreditierungsverbund für Studiengänge der Architektur und Planung (ASAP).*

1.3 Cooperation between Technical Committees

The Technical Committee 03 - Civil Engineering, Geodesy and Architecture cooperates with the other Technical Committees of ASIIN, especially in order to meet the requirements of interdisciplinary study programmes. In the application, the higher education institutions are requested to specify to which Technical Committee(s) the degree programme(s) should be assigned in the accreditation procedure.

The Technical Committee 03 is responsible for study programmes that combine a dominant share of content in the field of civil engineering, geodesy, architecture, interior design, or urban and regional planning. If the study programme contains a significantly smaller share of those contents, the Technical Committee 03 is jointly responsible with the other involved Technical Committees or only provides experts for the accreditation procedure.

In the field of geodesy, the following notes supplement the classification of study programmes:

In general, all study programmes in geodesy, geomatics, geoinformation or geoinformatics are assigned to the Technical Committee 03 - Civil Engineering, Geodesy and Architecture.

Study programmes in cartography, geomedia technology, or interdisciplinary geo-programmes with only a small proportion of geodesy, as well as geo-information, geomatics and geo-informatics programmes which have developed from a predominantly geoscientific orientation, are referred to the criteria provided by the Technical Committee 11 - Geosciences.

2 Study objectives and learning outcomes

The study objectives of a degree programme should contain the learning outcomes that graduates require for their professional occupation or for their further education. These outcomes differ in scope and depth according to the different objectives of Bachelor's and Master's degree programmes.

Regardless of the subject, graduates of Bachelor's programmes in accordance with the European Qualifications Framework (EQF level 6) generally have the following qualifications:

- advanced knowledge of a field of work or learning and a critical understanding of theories and principles,
- advanced skills that demonstrate mastery of the subject as well as the ability to innovate, and that are necessary to solve complex and unpredictable problems in a specialised area of work or study.

They can

- manage complex technical or professional activities or projects and take decision-making responsibility in unpredictable working or learning contexts,
- take responsibility for the professional development of individuals and groups.

Graduates at EQF level 7 (Master's degree level) have

- highly specialised knowledge, partly linked to the latest findings in a field of work or learning, as a basis for innovative thinking and/or research,
- a critical awareness for questions of knowledge in a field and at the interface between different fields,
- specialised problem-solving skills in the field of research and/or innovation, in order to acquire new knowledge and develop new processes and to integrate knowledge from different fields,

and can

- lead and design complex, unpredictable work or learning contexts that require new strategic approaches,
- take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams.

2.1 Notes for study programmes in civil engineering

The work of civil engineers aims at the sustainable design, transformation and maintenance of the built environment. It encompasses the entire life cycle of buildings and structures of all kinds, from planning and design, through construction and execution, to operation, maintenance and deconstruction. Civil engineers must be able to assess the scope and consequences of decisions with regard to social, ecological, economic and ethical aspects.

2.1.1 Notes for Bachelor's degree programmes in civil engineering

On the one hand, the Bachelor's degree is intended to enable an early entry into professional life through a professionally qualifying, specialist study of civil engineering and, on the other hand, to enable graduates to undertake more in-depth scientific studies or additional studies outside the subject area.

Graduates should be able to carry out essential activities in civil engineering independently and partly on their own responsibility, for example, the preparation of plans (drafts, approval, construction or execution plans), the static and constructional execution of construction projects of normal difficulty, the execution of planning tasks in transport or water management or independent work in construction management, construction supervision and the preparation of tenders.

The following paragraphs summarise appropriate learning outcomes for graduates of Bachelor's degree programmes in civil engineering.

Knowledge and understanding

Graduates have a critical understanding of the major theories, principles and methods of civil engineering, and are able to extend their knowledge beyond the discipline. Their knowledge and understanding is in line with the state of the art literature, and includes some in-depth knowledge at the current state of research.

Graduates have a broad and integrated knowledge and understanding of

- mathematical basics (e.g. vector algebra, linear systems of equations, analytical and descriptive geometry, differential and integral calculus, differential equations, elementary functions, calculus of variations)
- physical and, if applicable, chemical fundamentals in relation to civil engineering
- basics specific to civil engineering in technical mechanics (basic statics and the fundamentals of strength of materials), engineering informatics (e.g. programming language, data exchange in networks, construction-specific application software, possible uses of computer algebra systems, algorithms, data structures, object-oriented programming, data security), digital construction (e.g. data management, tracking systems, CAD programmes, Building Information Modelling, Big Data), building construction (e.g. technical regulations, shell construction and finishing construction, structural and constructive fire protection), building physics (e.g. fundamentals of thermodynamics, of room climate, moisture and building acoustics), building construction (e.g. technical regulations, shell construction and finishing construction, structural and constructive fire protection), building physics (e.g. fundamentals of thermodynamics, room climate, moisture protection and building acoustics), science of construction materials (e.g. manufacturing processes of building materials

and their mechanical, physical and chemical properties, characteristic values and requirements and testing standards), in geodesy (e.g. surveying fundamentals with regard to reference systems, surveying processes, GIS),

- interdisciplinary basics (e.g. economics, law, ecology, history of building),

- constructional basics e.g. in structural analysis and structural design (modelling, determinate and indeterminate structures, energy principles, force and displacement methods, computer-aided structural analysis, relationships between structure, actions and material), solid construction (properties of concrete, reinforcing steel, masonry, specific internal forces and safety, load-bearing behaviour, load-bearing capacity, reinforcement design, typical components), steel construction (safety concepts and material properties, load-bearing safety of bar-shaped components, composite construction, structural design), timber construction (properties of timber materials, specific aspects of fire protection and safety, load-bearing capacity and load-bearing behaviour) and geotechnics (soil types, types of foundations, excavation pits, anchorages, ground improvement and dewatering, fundamentals of soil mechanics),

- the basics of water engineering, e.g. in water resource management (hydrology and limnology), hydraulic engineering (structural typologies, load conditions, hydrostatic and hydrodynamic basics, pipe, channel and groundwater hydraulics) or in urban water management (water extraction, wastewater technology),

- the basics of traffic engineering, e.g. in transport planning (legal basics, urban and regional planning, urban and rural mobility, transport systems, traffic surveys, effects of traffic), in public transport systems (line networks and service planning, line routing, structure of the railway body, building materials and components, points, railway operation) or in road engineering (design, construction and operation of roads, road management, driving dynamics and driving geometry, routing, planning of junctions, road safety, road structure, environmental impact assessment),

- the basics of construction management, e.g. in construction project management (project management of construction projects, knowledge of interfaces, quality and risk management), in construction process management (process theory, construction methods, profitability calculation, construction equipment techniques, LEAN Construction, BIM, construction site equipment, construction site logistics, formwork technology, occupational safety, environmental regulations), in construction business management (specific business administration, corporate accounting, cost, performance and results accounting) or in construction planning management (project planning, recording of scope of services, cost planning and calculation, determination of area and room contents, tendering and awarding of contracts, performance specifications, contract design, award procedures, BIM)

Research, analysis, evaluation, method, application

Graduates are able to apply the acquired knowledge and understanding to activities or professions and to develop or improve solutions to problems in their field of specialisation. For this purpose, they can identify the problem, analyse solution methods, and select and apply the most suitable method. In doing so, they are able to take into account social, ecological, economic and legal aspects.

Graduates can use their basic knowledge to solve problems with professional plausibility in order to,

in structural engineering:

- assess and design load-bearing structures of different materials and calculate determinate and indeterminate load-bearing structures,
- design, construct and calculate solid and steel components as well as timber structures and to assess and ensure the load-bearing behaviour of components made of different materials as well as to limit deformations,
- take into account the properties of the ground during planning and execution; design, plan and calculate geotechnical structures;

in water engineering:

- calculate water cycle, water balance, hydrometry and runoff dynamics and apply basics of water law, flood protection and flood risk management,
- design and dimension hydraulic engineering measures and to deal with hydraulic problems,
- understand the tasks and procedures of urban water management as a basis for environmental engineering and to participate in the planning, construction, operation and maintenance of water supply and wastewater engineering facilities;

in traffic engineering:

- participate in urban and regional planning and develop planning goals in an interdisciplinary context,
- develop problem analyses and solution concepts in transport planning, including the planning of public transport systems and the design, construction and operation of road and rail routes and to develop infrastructure measures in road and rail transport,
- develop traffic control systems;

in construction management:

- plan and implement construction projects contractually and economically and prepare a quotation costing,
- recognise deviations and disruptions in the construction process to initiate countermeasures and recognise changes in performance,
- prepare project documents for cost planning as well as for the determination of area and volume, to draw up technical terms of a contract, to participate in the drafting of planning and construction contracts.

Independent of their area of specialisation, graduates can

- use information technology tools independently for various tasks and critically analyse computer results of simple control calculations;
- use classical and modern research methods to identify, interpret and integrate technical literature and data sets.

Practical skills, personal and social skills, scientific aptitudes

Graduates can

- work effectively in teams of different compositions and organise teams,
- recognise and resolve conflicting goals,
- present and represent work results in front of expert and non-expert audiences,
- derive and define research questions, apply research methods, and present and explain research findings.

They have developed practical skills for solving problems, conducting investigations and developing equipment, methods and processes.

They are qualified for lifelong learning.

2.1.2 Notes for Master's degree programmes in civil engineering

Master's degree programmes either deepen the knowledge, skills and competences of graduates in a specialist area of civil engineering or broaden them across the entire subject area. Due to the large number of possible specializations, these notes for Master's degree programmes are not formulated specifically for individual subject areas but instead are general and overarching in character.

Graduates deepen their knowledge, skills and competences so that they can take a new look at problems in civil engineering using more sophisticated scientific methods. This results in new options that go beyond the standard solutions in terms of informative value and degree of accuracy or cover areas that are not taken into account in the standard solution.

Through a broadening of knowledge, subject-related and interdisciplinary connections become more clearly recognizable, which also opens up new possibilities.

Knowledge and understanding

The knowledge and understanding of graduates enables them to independently develop and/or apply ideas related to the subject, which may be application- or research-oriented. They have a broad, detailed and critical understanding at the cutting edge of knowledge in one or more specialist areas.

As part of the expansion of knowledge, graduates are enabled to identify special aspects in tasks and to solve them against a scientific background. In addition, they are able to find ways of solving problems that occur less frequently in practice but require a professionaltreatment.

Research, analysis, evaluation, method, application

Graduates are able to assess the correctness of assumptions within the field through scientific and methodological considerations and are able to use these to solve problems of scientific and practical relevance. They integrate existing and new knowledge in complex contexts, even on the basis of limited information, make scientifically well-founded decisions and critically reflect on possible consequences.

- They can analyse complex tasks of civil engineering (e.g. supporting structures, infrastructure measures, construction processes).
- They can produce complex and innovative designs, constructions and developments, e.g. design of structures, development of new construction products and components, development of new construction methods, design of sewage systems, design and development of transport facilities, etc.
- They are able to develop new, sophisticated methods for verification and prediction, e.g. methods for the verification of stability, energy efficiency, noise protection, flood protection, water supply, etc.
- They can independently create plans and concepts in civil engineering and independently determine the requirements for overall supervision and management of complex processes.
- They are able to use scientific methods to independently describe and analyse new, unclear and untypical tasks in civil engineering against the background of the current scientific discussion.
- They are able to develop solution strategies for complex, undefined or innovative tasks on the basis of scientific methodology and current research results.
- They can test and further develop methods and check them with regard to their effectiveness and scope.
- They are able to integrate interdisciplinary research and development processes into planning and concepts.
- They are able to take a holistic and interdisciplinary approach to challenging projects and to manage them responsibly, taking into account sustainability, environmental compatibility, social and economic aspects, with the help of contributions from other disciplines.
- They are able to set up, maintain and develop quality management systems based on scientific methodology and thereby to evaluate their own activities as well as those of others.

Practical skills, personal and social skills, scientific competences

- Graduates are able to participate in the practical, methodological and scientific, theoretical development of the subject, to follow this development, to critically analyse and evaluate their own and other people's research results and to communicate about this in writing and orally.

- They are able to present solution strategies for complex innovative tasks to third parties.
- They are able to provide professional guidance to third parties in the analysis of new, unclear and atypical tasks.
- They have acquired personal and social skills (ability to think abstractly, system-analytical thinking, teamwork and communication skills, international and intercultural experience, etc.) to organise, implement and manage complex projects.
- They are able to design research questions, select research methods, justify the selection, explain and critically interpret research results.
- They can acquire new knowledge independently.

2.2 Notes for study programmes in the field of geodesy

Geodesy degree programmes are typically offered under the names of geodesy, surveying, geoinformatics, geoinformation, geomatics, or other related terms.

2.2.1 Notes for Bachelor's degree programmes in the field of geodesy

On the one hand, the Bachelor's degree is intended to enable an early entry into professional life through a professionally qualifying, specialist study of geodesy and, on the other hand, to enable graduates to undertake more in-depth scientific studies or additional studies outside the subject area.

The following paragraphs summarise appropriate learning outcomes for graduates of Bachelor's degree programmes in geodesy.

Knowledge and understanding

Graduates possess a critical understanding of the major theories, principles and methods of geodesy, and are able to extend their knowledge beyond the discipline. Their knowledge and understanding is in line with the state of the art literature, and includes some in-depth knowledge at the current state of research.

Graduates

- have acquired sound knowledge and understanding of the mathematical and scientific fundamentals, e.g. in the subject areas of mathematics, physics and information processing,
- have acquired profound knowledge and understanding of the subject-specific fundamentals of geodesy and geoinformation, e.g. reference systems and spatial reference, geodata acquisition and geodetic measurement technology, data analysis, adjustment calculation, statistics, modelling and presentation of spatial information,
- have acquired a sound knowledge and understanding of subject-specific applications, e.g. in the fields of geodesy (satellite geodesy, physical geodesy), engineering geodesy (measurement methods and sensor systems, routing, setting-out and monitoring, navigation), geoinformatics (geodata management, geodata analysis, geovisualisation and cartography,

software engineering), photogrammetry and remote sensing (sensor systems, image processing, analysis and interpretation), land and real estate management (real estate cadastre, land register, land development, real estate valuation and market analysis),

- have basic knowledge of interdisciplinary areas relevant to the exercise of their profession, e.g. public and private law, business administration, environmental protection.

Research, analysis, evaluation, method, application

Graduates are able to apply the acquired knowledge and understanding to activities or professions and to develop or improve solutions to problems in their field of specialisation. For this purpose, they can identify the problem, analyse solution methods and select and apply the most suitable method. In doing so, they are able to take into account social, ecological, economic and legal aspects.

Graduates can

- apply acquired skills in dealing with subject-specific measuring and IT systems,
- use spatial methodological competences,
- collect, structure, analyse, visualise, evaluate and interpret relevant information related to the Earth (or parts of it) on the basis of scientific methods,
- use information technology tools independently for various tasks and critically analyse computer results of simple control calculations,
- use classical and modern research methods to identify, interpret and integrate technical literature and data sets.

Practical skills, personal and social skills, scientific competences

Graduates

- formulate technical and relevant solutions to problems,
- justify their own actions with theoretical and methodological knowledge,
- reflect on and take into account different perspectives and interests of other stakeholders when solving problems,
- can justify solutions in a theoretically and methodically sound manner in discourse with experts and people from outside the field,
- can work effectively in teams of different compositions and organise teams,
- can assess their own abilities,
- reflect on and use relevant design and decision-making options,
- recognise the situational framework for professional action and justify decisions ethically,
- reflect on their professional actions in relation to social expectations and consequences,

- can apply research methods and present and explain research results,
- have developed practical skills for solving problems, conducting investigations and developing equipment, methods and processes,
- are capable of lifelong learning.

2.2.2 Notes for Master's degree programmes in the field of geodesy

Building on a first university degree, programmes at the Master's level lead to in-depth analytical-methodical competences. At the same time, the knowledge and skills acquired during the first degree are deepened and expanded.

Knowledge and understanding

As part of the expansion of knowledge, graduates are enabled to identify special aspects in tasks and to solve them against a scientific background. In addition, they are able to find solutions for tasks that occur less frequently in practice but require a professionally sound treatment. They have a broad, detailed and critical understanding at the cutting edge of knowledge in one or more specialist areas.

Graduates deepen their knowledge in such a way that they can take a new look at topics that are part of the canon of the Bachelor's programme using more sophisticated scientific methods. This results in new options that are superior to the standard solutions in terms of informative value and degree of accuracy or cover areas that are not taken into account in the standard solution.

Research, analysis, evaluation, method, application

Graduates are able to

- deal with new spatial problems in a critical and independent manner,
- independently design, develop and use complex and novel evaluation models for all areas of geodesy,
- model the corresponding software applications,
- develop geodata and specialised data models independently, discuss them in an interdisciplinary context and apply them in a targeted manner,
- describe and analyse demanding spatial tasks independently, develop solutions and to implement them responsibly, and to collect and evaluate the required data and its sources, even if the tasks are unclearly defined,
- develop new solution strategies and to test and further develop methods for this purpose and to check them with regard to their effectiveness and scope.

For this purpose they have

- in-depth and special knowledge of mathematical-statistical methods,
- a deep, subject-specific and interdisciplinary understanding of the Earth as a whole, its gravitational field and its astronomical position and context,

- advanced IT skills.

Practical skills, personal and social skills, scientific competences

Graduates are able to

- consider demanding projects holistically and in an interdisciplinary fashion in order to optimally integrate the contribution of geodesy,
- discuss alternative, theoretically justifiable solutions to problems in an interdisciplinary and subject-related manner,
- recognise potential for conflicts when cooperating with others and to reflect and solve while taking into account the existing structural conditions,
- ensure the implementation of solution processes appropriate to the situation through their actions,
- lead working groups and ensure result-oriented and efficient teamwork,
- independently acquire the current state of scientific knowledge in the various fields of geodesy and to examine the extent to which this is helpful for their own tasks,
- participate in the practical, methodological, scientific and theoretical development of the subject, to follow this development, to critically analyse and evaluate their own and other people's research results and to communicate about this in writing and orally.

2.3 Notes for study programmes in architecture

2.3.1 Professional recognition as an architect

Within the higher education landscape, the teaching of architecture occupies a special position in that it educates towards a protected profession that is shaped by national and international standards on core areas of education and their duration. These are:

Germany:	In Germany, professional recognition is carried out by the registration committees of the federal states in accordance with their architecture laws, based on the EU Directive on the recognition of professional qualifications. This is the prerequisite for entry in the lists of architects of the chambers of architects.
Europe:	The Directive of the European Parliament and of the Council on the recognition of professional qualifications.
Worldwide:	The UNESCO/UIA Charter for Architectural Education and the UIA Accord on Recommended International Standards of Professionalism in Architectural Practice.

The prerequisite for admission into the profession is in all cases a completed university degree in specific study programmes. According to the EU requirements, the university studies must comprise at least 4 years. In Germany, the requirements are regulated in the respective state laws, which generally provide for a five-year Bachelor's and Master's degree or a four-year Bachelor's degree. Individual states, such as Bavaria and Hessen, have also established state-specific special regulations. The UIA (International Union of Architects) requires five years of study in a Bachelor's and a Master's programme for worldwide recognition.

In accordance with the above-mentioned requirements, becoming a licensed architect is thus possible, apart from some special regulations in individual federal states, through completing a 5-year consecutive course of study, whereby the Bachelor's degree programme comprises 6 or 7 semesters, or through an 8-semester Bachelor's degree programme, which however does not meet the UIA requirements.

2.3.2 Competences of architects

In order to meet the requirements for the professional activity of an architect, graduates have acquired the following knowledge and skills:

- the ability to create architectural designs that meet both aesthetic and technical requirements,
- adequate knowledge of the history and theory of architecture and related arts, technologies and humanities,
- knowledge of the visual arts due to their influence on the quality of architectural design,
- adequate knowledge of urban planning and design, planning in general and planning techniques,
- understanding of the relationship between people and buildings and between buildings and their surroundings, and understanding of the need to relate buildings and the spaces between them to human needs and scale,
- understanding of the architect's profession and his role in society, particularly in producing designs that consider social factors,
- knowledge of the methods used to review and develop the design for an architectural project,
- knowledge of the structural and civil engineering problems associated with building design,
- adequate knowledge of physical problems and technologies related to the function of a building - creating comfort and protection against weather conditions,
- the technical skills required to meet the needs of the users of a building within the constraints imposed by cost factors and building regulations,
- adequate knowledge of the trades, organisations, regulations and procedures involved in the practical implementation of construction plans and the integration of the plans into the overall planning.[1]

[1] Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications.

In order to achieve this qualification goal, students acquire skills in design and construction as well as knowledge and skills that enable them to fulfil their role as generalists and to coordinate interdisciplinary projects, such as

Design competence

Graduates have the ability to

- think creatively and to manage and integrate the efforts of others involved in the planning process,
- gather information, define problems, apply analysis, make critical judgements and formulate strategies for action,
- think three-dimensionally and to develop designs methodically, both scientifically and artistically,
- bring into accordance divergent factors, integrate knowledge and apply skills in creating a design solution.

Knowledge and understanding

Cultural and artistic studies

Graduates

- can apply knowledge of historical and cultural references in international architecture,
- can apply knowledge of the influence of the visual arts on the quality of architectural design,
- have developed an understanding of the heritage of the built environment and issues relating to the protection of historical monuments,
- have developed an awareness of the interconnections between architecture and philosophical and political currents and the cultural development of other creative disciplines.

Social and human sciences

Graduates

- have the ability to develop programmes for construction tasks, defining the needs of clients, the public and users,
- have an understanding of the social context of a construction task,
- have an understanding of the ergonomic and spatial requirements of the working environment,
- have knowledge of the relevant laws, rules and standards for planning, design, construction, health, safety and use of the built environment,
- have knowledge of philosophy, political science and ethics relevant to architecture,

- can apply the knowledge of society, builders and users,
- can identify and define functional conditions for different environmental areas.

Environmental Science

Graduates

- have an understanding of issues such as environmental sustainability, designs to reduce energy consumption and impact on the environment, and an understanding of passive systems and their controls,
- have an awareness of technology and technology implications,
- have an awareness of the history and practice of landscape architecture, urban design, regional and national planning,
- can apply their knowledge to natural systems and the built environment.

Engineering Sciences

Graduates

- can apply their knowledge of the supporting structure, materials, supply and disposal,
- have an understanding of the processes of technical design and the integration of the supporting structure, structural engineering, and technical finishing into a functional entity,
- have an understanding of infrastructure (development) and of communications, maintenance and security systems,
- have an awareness of the importance of technical infrastructure in the realisation of a design and an awareness of construction cost planning and control,
- have knowledge of the physical problems and the technologies related to the function of a building to provide comfort and protection against the weather.

Design methodology

Graduates

- can apply the knowledge of design theory and methodology,
- have an understanding of design procedures and design processes as well as analysis and interpretation of frameworks,
- have knowledge of the history of design and architectural criticism.

Construction economics / construction management

Graduates

- can apply knowledge of professional, business, financial and legal requirements,

- have an awareness of the operating principles of the real estate industry, financial relationships, real estate investment, alternative methods of contracting, and facilities management,
- have an awareness of the potential roles of architects in familiar and in new fields of action as well as in an international context,
- have an understanding of market mechanisms and their effect on the development of the built environment, an understanding of project control, project development and client consultancy,
- have an understanding of professional ethics and codes of conduct in relation to the practice of the profession and an understanding of an architect's legal obligations in relation to registration,
- can plan and coordinate the construction process,
- can organise the processes involved in the construction of buildings and their economic execution.

Skills

Graduates

- have the ability to work in a team and communicate ideas using language, text, drawing, statistics and models,
- have the ability to use analogue and digital, graphic and modelling skills to analyse and develop a design project, and to communicate this clearly,
- have an understanding of assessment systems using manual and/or electronic means to diagnose built environments.

Appropriate knowledge, skills and abilities should be acquired by students in all courses of study that aim at a licence as an architect.

2.3.3 Notes for Bachelor's degree programmes in architecture

Bachelor's degree programmes of 6 or 7 semesters, which are not intended to open up an immediate professional recognition, qualify students for fields of activity in planning and building, in public administration and in the real estate industry. These study programmes only qualify for the profession of architect if they are followed by a Master's degree programme of 4 or 3 semesters that builds on them.

Graduates of these Bachelor's degree programmes have, for example:

- an understanding and knowledge of the subject content and are able to apply this knowledge in various professional fields. This includes, in addition to advanced standard knowledge, individual aspects that go far beyond this;
- acquired skills in analysis and synthesis of problems and development of problem-solving concepts,

- competences in the scientific identification of all relevant statements and their interpretation, in the determination of results including the social, scientific and ethical impact,
- in particular, acquired skills and basic knowledge in design, building construction, building technology and building economics and developed awareness of coordination and implementation of projects,
- the ability to present and communicate all information, ideas, problems and solutions in front of a specialist or lay audience.

2.3.4 Notes for Master’s degree programmes in architecture

Master's degree programme that build on these Bachelor’s programmes supplement the knowledge, skills and abilities from the previous course in order to reach the above-mentioned qualification profile for professional recognition as an architect (see section 2.3.2).

2.3.5 Practice

Pre-study internship

It is generally recommended that students complete a construction-related internship prior to commencing their studies. Such an internship is not credited to the period of study. It serves to review the chosen course of study and brings valuable experience to the degree programme.

Internships during the course of study

Internships that are completed during the studies are part of the student workload and are assigned ECTS credits. The higher education institution must transparently present which contents are taught in detail in the internships and how they relate to the curriculum. The contents of the internship must be agreed between the higher education institution and the internship provider, for example by means of a learning agreement.

Internship after a completed Bachelor's degree as admission requirement for a Master's degree

A pre-study internship may be required as a further special admission requirement for a Master's degree programme. An internship between the Bachelor's and the Master's programme has no influence on the consecutive nature of the Master's programme. According to the UNESCO/UIA standards, this practical period may not be included into the study period because this reduces the theoretical study components.

Practical occupation

The professional activity that follows the studies is not part of the university education, but it is to be seen in the context of the admission as an architect. After the successful completion of the studies, the laws on architects of the German federal states require practical professional activity under the guidance of an architect in the relevant specialist field in order to subsequently - after formal admission and registration in the list of architects - be allowed to use the professional title of architect. The duration of this activity is at least two years.