

Module code	Module title	Module description	Semester	ECTS
<b>Compulsory modules „Utility and Environmental Engineering“</b>				
4VU-MATHE-12	Mathematics	Students consolidate and expand their basic mathematical skills and are able to apply the acquired knowledge in an interdisciplinary context. Focus is placed on the training of logical thinking and the acquisition of strategies for the solution of complex problems. This involves the mathematical description of technical processes, primarily in the field of Utility Engineering, using methods of linear algebra and analysis.	1 and 2	6
4VU-WFF-10	Materials and Production Engineering, Joining Technology	Students acquire fundamental knowledge of materials and manufacturing processes for semi-finished products and products used in utility and environmental engineering and are able to apply this knowledge in a confident manner. The module imparts knowledge of the properties and treatment options of materials as well as testing methods and their application by using practical examples, including the selection of materials for specific applications. Taking into account the specific requirements of the field, the module also presents elementary manufacturing processes, thus enabling students to view the interrelationships between operational conditions, material selection and manufacturing processes from an engineering perspective. Subsequently, specific technical knowledge of joining technology is imparted with reference to possible applications in the field of utility engineering.	1	5
4VU-NATG-12	Fundamentals of Natural Sciences	Students acquire and apply fundamental knowledge of physics, chemistry and thermodynamics and are able to scientifically model technical problems. Furthermore, students are enabled to correctly interpret technical tasks from a scientific point of view and to implement them in a professional engineering way.	1 and 2	10
4VU-INFO-12	Information Technology	Complex 1 familiarizes students with network technology. This involves the confident use of system applications of the in-house network. Complex 2 focuses on the safe use of drawing and design software. For this purpose, the most current version of the software should be made available. Having gained the necessary fundamentals, students are able to confidently apply various applications of utility engineering, e.g. sanitary, heating, ventilation as well as air-conditioning and refrigeration technology. Furthermore, they can interpret the respective calculation results from a technical point of view. In addition, students learn how to use drawing output devices in a confident manner.	1 and 2	7
4VU-BERE-23	Business Administration / Law	Students acquire knowledge of the fundamentals of business administration and law in the field of utility and environmental engineering. They deal with the interrelationships between engineering practice and business results, taking into account social and societal aspects.	2 and 3	7

		<p>Students get to know the necessity of targeted approaches and holistic perspectives. They are familiarized with the structure of a company in the industry, the economic conditions for enterprises as well as the recording, decision-making and control mechanisms in the organizational structures. Students acquire practical knowledge of legal concepts of public and private law as well as corporate environmental protection law. Furthermore, they gain an overview of the nature and scope of planning and approval requirements for utility engineering facilities. Students develop methodical approaches for the integration of legal requirements into planning and the preparation of construction work.</p>		
4VU-ENG-12	Foreign Language / English	<p>Students improve their English communication skills in the respective fields of study. This includes a systematic strengthening of both written and oral communication skills.</p> <p>The module adopts a concept which allows students to improve their general language skills in English business communication and to expand their vocabulary in subject-specific contexts. Students develop targeted conversation strategies and learn to professionally present their company or themselves in the foreign language.</p> <p><b>Methodology</b></p> <p>Students read, analyze, translate, and create technical texts. In addition, the module discusses and practices structures that are relevant to the specific field. To improve writing skills, students gain basic knowledge of editorial procedures, practices and norms.</p> <p>The seminar involves a project where students put this acquired knowledge into practice. Students write individual technical articles and edit their drafts. In groups, they digitally process the results of this work and present them online.</p> <p>The knowledge acquired in the course of the seminar project is assessed in the final written examination.</p>	1 and 2	5
4VU-TEME-23	Engineering Mechanics	<p>Upon completion of the module, students have acquired fundamental knowledge in the field of engineering mechanics and strength of materials. They are able to apply relevant concepts and methods for simple load cases. In addition, they are enabled to identify complex structural problems and prepare them for further processing by structural engineers or designers.</p>	2 and 3	6

4VU-GAT-12	Fundamentals of Plant Engineering	The module provides the basis for the design of a circuit diagram for the respective subsector. To this end, students must be able to produce drawings and read them correctly. In order to achieve this competence, it is imperative to be familiar with the structure and function of the most important plant components of the respective sub-sector. At the same time, advantages and disadvantages of the components must be correctly identified in order to find optimal solution alternatives for the respective task when designing a circuit diagram. In addition, students are familiarized with the necessary boundary conditions that must be taken into account when installing the individual components in the system. The acquired knowledge and skills are to be consolidated and deepened in suitable laboratory exercises.	1 and 2	7
4VU-STRÖM-23	Fluid Mechanics	The module conveys the laws of fluid mechanics, the problems of hydrostatics, frictionless and frictional flow and their application in utility engineering. Students are thus familiarized with the fundamentals of planning and calculating utility engineering systems. They are to be applied in the evaluation of different types of pipe and sewer systems with different media.	2 and 3	5
4VU-ETGG-34	Electrical Engineering / Fundamentals of Building Automation	Students acquire knowledge of the fundamentals of electrical engineering and its application in various areas of utility and environmental engineering. This includes the principles of electrical engineering, device-related knowledge of electrical drives and electrical protective measures. Moreover, students gain knowledge of the fundamentals of metrology and control engineering systems in utility and environmental engineering and how to apply this knowledge to appropriate problems.	3 and 4	7
4VU-PROMA-34	Project Management	Students acquire the fundamentals of project scheduling, construction site scheduling, construction site set-up, procurement and costing. The knowledge is applied to selected case studies. Furthermore, the module covers legal regulations for public and private clients. Particular attention is paid to the application of the German Construction Contract Procedures (VOB), Parts A, B, C and the German Ordinance on Architects' and Engineers' Fees (HOAI). Students are enabled to develop specifications of services and bills of quantities for utility engineering planning, tender preparation and execution.	3 and 4	5
4VU-GVT-34	Fundamentals of Utility Engineering	Students acquire and apply fundamental knowledge of utility engineering. They gain knowledge from the fields of heating, ventilation, air conditioning and sanitary engineering, deal with relevant regulations of building services engineering and learn to apply them appropriately to technical problems. Students thus obtain an overview of modern heating, ventilation, air-conditioning and sanitary engineering systems. They develop the competence to correctly interpret technical tasks from the perspective of utility engineering and implement them in a	3 and 4	10

		professional engineering manner. The knowledge is deepened in subject-specific laboratory exercises.		
4VU-GEE-34	Fundamentals of Renewable Energies	The module provides a comprehensive overview of the possible use of alternative energies. This includes both philosophical and technical considerations in order to promote an appropriate environmental awareness among students. From the technical point of view, students are enabled to set up suitable system configurations for special applications, which are ecologically but also economically justifiable and can thus be used in practice. Having made this selection, students are able to design the corresponding systems according to the specific requirements of their field. The acquired knowledge and competences are consolidated and deepened in corresponding laboratory exercises.	3 and 4	8
<b>Modules " Technical Building Equipment"</b>				
4VU-AHT-56	Applied Heating Engineering	Students are enabled to plan, design and calculate complete heating systems according to technical regulations. This also includes the integration of alternative systems for the use of renewable energies for heat generation. In addition to the design of the corresponding systems, the module also covers environmental protection regulations and related planning and design measures.	5 and 6	5
4VU-ALK-56	Applied Ventilation and Air Conditioning Engineering	Students are enabled to plan, design and calculate ventilation and air-conditioning components as well as complete ventilation and air-conditioning systems in accordance with acknowledged technical regulations, current requirements and the necessity of energy efficiency. This includes in particular the integration of alternative systems for the use of renewable energies, the necessity of heat recovery and the use of waste heat. In addition to the professional design of the corresponding systems, the module also focuses on environmental protection regulations and relevant measures.	5 and 6	7
4VU-KÄTGL-34	Refrigeration Engineering 1 - Fundamentals	Students acquire and apply fundamental knowledge in the field of refrigeration engineering with a focus on the vapor-compression refrigeration machines. Students are enabled to understand refrigeration engineering tasks and to convert them into technical solutions in an engineering manner. The module also focuses on solutions for reducing energy requirements and optimizing systems for technical refrigeration and for the reduction of environmentally relevant emissions.	3 and 4	6
4VU-GAUT-50	Building Automation	Students acquire knowledge of building installation systems and their various applications in building services engineering as well as the networking of buildings for control, monitoring and energy-efficient operation of the facility technology, e.g. BUS systems. This includes skills and abilities that enable students to evaluate overall concepts of a utility engineering system and to	5	4

		draw appropriate conclusions for practical realization taking into account a variety of building automation aspects.		
4VU-EES-60	Renewable Energies and Energetic System Analysis	Students acquire the fundamentals of energy management, the classification of energy sources, types of energy, the structure of primary energy consumption and the growing importance of renewable energies. The module analyzes the most important energy sources and their market, and conveys fundamental business concepts such as investment, financing, the company value circle and depreciation, as well as capital value performance. Students gain knowledge of how to evaluate investments according to various methods and apply this investment evaluation to building services equipment. Students learn how to calculate capital, demand and operating costs. Furthermore, the module analyzes the legal basis for the use of renewable energies.	6	5
<b>Modules - Specialization "Technical Building Systems" (field of study: "Technical Building Equipment")</b>				
4VU-GAS-45	Gas and Exhaust Gas Systems in Buildings	The module imparts fundamental technical knowledge in the field of gas supply for buildings and properties as well as exhaust gas technology. In this context, students are familiarized with the special characteristics of individual combustion gases that are relevant for use in buildings. In addition to central systems using natural gas as combustion gas, this also includes liquefied petroleum gas systems. Thus, students are enabled to design and calculate gas supply and exhaust gas systems in accordance with the technical standards and regulations.	4 and 5	6
4VU-SANI-56	Applied Sanitary Engineering	Students gain expertise in the areas of drinking water supply, hot water production and drainage technology. The module covers planning requirements such as hygiene-conscious design in compliance with the German Drinking Water Ordinance, energy-efficient heating of drinking water, and environmentally compatible drainage technology. Students are thus enabled to optimally plan and calculate sanitary engineering systems.	5 and 6	4
4VU-PPTGS-56	Planning/ Project Planning in Building Services Engineering	Students are enabled to apply and implement the knowledge acquired in the basic and specialized subjects. In this context, students analyze the planning tasks in detail in order to develop feasible projects. Focus is placed on the acquisition of ready-to-use knowledge. At the same time, teamwork is intended to contribute to the development of social skills. The gained competencies are to be applied in a project that can be practically and sustainably implemented and which meets all technical regulations and requirements. In this process, students are expected to make consistent use of software packages for calculations and the creation of drawings.	5 and 6	7
4VU-SGGU-50	Special Fields of Building and	The module imparts knowledge and skills on special, partly interdisciplinary topics of building services engineering as well as on environmental regulations and measures in the field of utility	5	6

	Environmental Engineering	and environmental engineering. The topics are aligned with the respective current conditions and innovations and include special areas of building services engineering, such as rainwater utilization and swimming pool technology. The imparted specialist knowledge of fundamental methods for recording and assessing pollutants in exhaust gases as well as knowledge of the individual procedures for the reduction of emissions enable students to select specific techniques suitable for the problem in question and provide suppliers of environmental protection technology with the necessary input data for further technical planning.		
<b>Modules - Specialization "Refrigeration and Air Conditioning Engineering" (field of study: "Technical Building Equipment")</b>				
4VU-KÄTPR-45	Refrigeration Engineering 2 - Process Calculations	In this module, students become acquainted with analytical solutions as well as different calculation/balancing methods for the numerical solution of refrigeration (related) problems and the presentation of the results in corresponding diagrams. In this context, the module considers the different temperature ranges of refrigeration systems, alternative processes of refrigeration as well as the coupling with related processes of energy conversion.	4 and 5	6
4VU-KÄTKA-56	Refrigeration Engineering 3 - Components and Working Materials	Students are familiarized with the components of selected refrigeration processes, their functions and design according to normative requirements, as well as their visualization in system flow diagrams. Further focus is placed on components of the I&C technology and safety-related aspects. Students also gain knowledge of various working materials, their application and areas of application.	5 and 6	4
4VU-KÄTKG-50	Refrigeration Engineering 4 - Industrial and Commercial Applications	Students acquire knowledge of the various application areas of refrigeration engineering in terms of their power size and use as well as their special features. To this end, students attend presentations given by manufacturers, operators and research institutes as well as field trips to relevant companies and users. In addition to refrigeration in various dimensions with stationary application, the module also addresses refrigeration distribution, storage, maintenance and operation as well as energy efficiency and special applications.	5	6
4VU-PPKÄT-56	Refrigeration Engineering 5 - Planning / Projecting in Refrigeration Engineering	Students are enabled to apply and implement the knowledge acquired in the basic and specialized subjects of refrigeration and air conditioning engineering. In this context, students analyze the planning tasks in detail in order to develop feasible projects. Focus is placed on the acquisition of ready-to-use knowledge. At the same time, teamwork is intended to contribute to the development of social skills. The gained competencies are to be applied in a project that can be practically and sustainably implemented and which meets all technical regulations and requirements. In this process, students are expected to make consistent use of software packages for calculations and the creation of drawings	5 and 6	7

<b>Modules "Thermal Energy Technology and Utility Systems"</b>				
4VU-BVT-45	Construction Engineering and Surveying	Students acquire knowledge for the planning of pipeline routes. For this purpose, the module first conveys the basis for planning, i.e., surveying and the related technical processing of the results. For professional route planning, students are familiarized with the possible technologies for laying pipelines. In this context, the media distribution systems should always be considered up to the end user. Further emphasis is placed on the rehabilitation methods for existing pipeline systems, as this problem will gain increasing importance throughout Germany and Europe in the coming years. The acquired knowledge and skills are consolidated and deepened in corresponding laboratory exercises.	4 and 5	6
4VU-RHYD-56	Pipe Hydraulics	Students acquire and apply fundamental knowledge of physics and fluid mechanics and are enabled to scientifically model technical problems. Furthermore, students gain the competence to analyze technical problems correctly from a scientific point of view and to implement them professionally in an engineering manner. Focus is placed on the ability to differentiate between various network structures in order to draw the correct conclusions for the design of the respective systems and to design technically correct pipe networks. The acquired knowledge and skills are consolidated and deepened in suitable laboratory exercises.	5 and 6	5
4VU-RST-56	Pipe Statics	Students are able to apply the respective calculation models in accordance with the corresponding hypothesis. To this end, students have the competence to properly analyze pipe geometries in order to subsequently perform all necessary calculations for structural verification. The investigations are intended to ensure that designed pipe geometries do not pose any risk to individuals or the environment during any operating conditions or operating times. For this reason, students acquire the competence to interpret and correctly evaluate calculation results.	5 and 6	5
4VU-TES-50	Thermal Energy Systems	Students are familiarized with the technical procedures for the provision of energy, which is required in a variety of forms, e.g. thermal energy, electrical energy, etc. This includes the use of fossil fuels as well as the possibility of using alternative energy sources. To this end, students are required to have basic knowledge of conversion processes. Drawing on this knowledge, it is then possible to develop ideas for the optimization of the processes. All these processes require the consideration of social, political, economic and ecological boundary conditions. The acquired knowledge and competences are consolidated and deepened in suitable laboratory exercises.	5	5
4VU-KÄTEV-34	Refrigeration Engineering	Students acquire and apply fundamental knowledge in the field of refrigeration engineering with a focus on the vapor-compression refrigeration machines. Students are enabled to understand	3 and 4	6

		refrigeration engineering tasks and to convert them into technical solutions in an engineering manner. The module also focuses on solutions for reducing energy requirements and optimizing systems for technical refrigeration and for the reduction of environmentally relevant emissions.		
4VU-SVT-50	Systems and Process Engineering	Students become familiar with the technical and biological-chemical processes for the treatment of the respective media. Thus, they are enabled to define the individual natural and technical circulatory systems. At the same time, students are to be able to intervene in the different process stages in a professional manner to optimize the processes. Students gain the necessary knowledge of the individual components of the corresponding process stages that is required for such process optimization. The acquired knowledge and skills are consolidated and deepened in laboratory exercises.	5	5
4VU-AES-60	Application of Renewable Energies and Energy Systems Analysis	Students become acquainted with procedures and possibilities for the application of renewable energies and deepen their knowledge of plants that provide such resources (energy and water) or store them for a required period of time. At the same time, students are familiarized with new technologies and their plant components. This enables them to plan plants that use renewable energy sources. Particular emphasis is always placed on the economical use of the available resources, so that the environmental aspect plays an important role in the evaluation of these technologies. Furthermore, students are enabled to carry out efficiency analyses for these plants and draw conclusions for a feasible practical application. The acquired knowledge and competences will be deepened in laboratory exercises.	6	5
4VU-PPTEV-56	Planning / Project Planning	Students are enabled to apply and implement the knowledge acquired in the basic and specialized subjects. In this context, students analyze the planning tasks in detail in order to develop feasible projects. Focus is placed on the acquisition of ready-to-use knowledge. At the same time, teamwork is intended to contribute to the development of social skills. The gained competencies are to be applied in a project that can be practically and sustainably implemented and which meets all technical regulations and requirements. In this process, students are expected to make consistent use of software packages for calculations and the creation of drawings.	5 and 6	7
4VU-SGET-50	Special Fields of Energy Engineering	Students acquire special and supplementary knowledge on how utility engineering systems can be improved and optimized in terms of energy efficiency. In addition to innovative technologies, focus is also placed on the automation of plants by means of modern instrumentation and control technology and the economical design of plants, e.g. by using technical insulation systems. Students gain the competence to design energy-efficient plants and operate them in a	5 and 6	6

		reliable manner. To this end, they are familiarized with the most modern plant and energy contracting systems.		
<b>Practical modules</b>				
4VU-PM1-10	VU Processes in the Company	In the first practical phase, students become familiar with their workplace, their partner company and elementary processes and activities. They deal with the information systems used in the company and learn to understand these systems for the solution of pending tasks. They are directly integrated into practical teams and thus receive essential impulses for the development of new or the consolidation of previously acquired social competences. Students deepen the professional knowledge gained in the theoretical modules and apply it in an exemplary manner in operational practice.	1	6
4VU-PM2-20	Extension of Basic Skills	This practical phase focuses on possible applications and functionalities of utility engineering plants and plant components. Students expand their basic skills in evaluating technical documentations with regard to their information content for relevant assemblies and products. Students deepen the professional knowledge gained in the theoretical modules and apply it in an exemplary manner in operational practice. They document their knowledge gain in a written report.	2	6
4VU-PM3-30	Introduction to Engineering Work	In this practical phase, students are familiarized with engineering contexts. They are able to gather and classify relevant input information for internal documentation processes. Furthermore, they are enabled to develop solutions from the customer's or contractor's perspective and to take the first steps towards their implementation. They independently process parts of a task in a team.	3	6
4VU-PM4-40	Autonomous Engineering Work	Upon completion of the module, students are able to apply and use engineering skills in a problem-oriented manner. They are able to collaborate on complex tasks in an academic manner and participate constructively in the solution of tasks. Students handle more detailed problems and prepare a written assignment on their work to demonstrate their knowledge and competencies.	4	6
4VU-PM5-56	Independent Engineering Work	In this practical phase, students work independently on relevant professional tasks, subareas, and documentations that relate to their future field of work, taking into account the theoretical background they have acquired. Main emphasis is placed on the integration of the solution into	5 und 6	6

		the company's process, including the analysis of the related information flows. The student demonstrates their ability to work in an engineering environment by completing a practical assignment, a term paper, and a practical oral examination.		
4VU-DA-60	<i>Diplom</i> Thesis	In their <i>Diplom</i> thesis, students process, critically evaluate and develop an engineering problem within a specified period of time, applying the acquired theoretical, methodological and practical knowledge in a targeted and result-oriented manner, and present it in a logically structured and comprehensible manner in the form of a scientific paper. During the oral defense of the results of their thesis, students demonstrate their knowledge and competencies as well as their communication and argumentation skills in a colloquium.	6	12