

## **Curriculum**

for the Master's degree program

Information and Communications Engineering (ICE)

Degree program code L 066 488

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# Curriculum for the Master's Degree Program

## *Information and Communications Engineering (ICE)*

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## § 1 General Remarks

- (1) The Master's degree program *Information and Communications Engineering* is worth 120 ECTS credits. This corresponds to a scheduled study duration of 4 semesters. In accordance with § 54 Paragraph 1 of the Universities Act 2002 (hereafter: UA), the Master's degree program *Information and Communications Engineering* is assigned to the group of Engineering Sciences programs.
- (2) The workload for the individual program achievement is indicated in ECTS credits. The workload must amount to 1500 hours in one year, for which 60 credits are awarded. The workload is comprised of the element of independent study as well as the semester and contact hours (§ 51 Para. 2 Line 26 UA).
- (3) The Master's degree programme *Information and Communications Engineering* offers three branches of study. The student selects one of the three branches of study:
  - Branch of study Networks and Communications (NC): the list of subjects pertaining to this branch of study is provided in Table 1.
  - Branch of study Autonomous Systems and Robotics (ASR): the list of subjects pertaining to this branch of study is provided in Table 2.
  - Branch of study Business Engineering (BE): the list of subjects pertaining to this branch of study is provided in Table 3.
- (4) The language of instruction in the Master's degree program *Information and Communications Engineering* is English.

## § 2 Qualification Profile

The qualification profile describes the scientific and professional qualifications that students gain by completing the degree program.

This Master's degree program was designated "*Information and Communications Engineering*" in preference to the German name "*Informationstechnik*" (Engl. "Information Technology"), as the courses are taught in English in line with ongoing internationalisation efforts.

Information technology is one of the crucial drivers of technical and economic development in Europe and across the globe. Information technology systems shape our daily working and private lives. We work on the laptop computer and the PC, listen to music on the MP3 player, and are globally networked through the Internet and the mobile telephone. When we are on the move, systems such as driver assistance in the car or automatic passenger information on local public transport provide support. Medical clinics are furnished with high-tech equipment for the diagnosis and treatment of injuries and diseases.

In the industrial sector, robots assemble complicated devices, and networked sensors monitor chemical processes. The term "information technology" refers to any instance that involves information being produced, processed, transported, stored, and issued using technical means. In this context, information can take many forms, e.g. voice data, videos or measurement data.

Increasingly, information technology systems are also disappearing into objects of everyday use—they are quite literally "embedded" there, turning them into "intelligent objects",

which imperceptibly assist humans in their activities. The terms “Ambient Intelligence”, or “Pervasive Computing and Communications”, and the “Internet of Things” are also used in this context. This is also reflected in the development of information technology, which is becoming an interdisciplinary discipline for other key technologies such as, for instance, medical engineering, nanotechnology and biotechnology.

In addition to the technical components, economic aspects are also of great significance for the success of innovations in information technology. This fact is accounted for by the inclusion of the separate branch of study “Business Engineering” within the Master’s degree program *Information and Communications Engineering*.

The creation of innovations in the sphere of information technology requires excellently trained and creative engineers. They develop new ideas and products, and they offer services that make life simpler and more efficient thanks to modern information and communications technology, and that also help to make the world a little bit smaller. However, continuous and rapid change is also a typical characteristic of the field of information technology. New knowledge and current products can very quickly become obsolete. This is why there is a great demand for engineers who have received a broad and well-founded education, and who are skilled at thinking analytically and grasping complex interrelationships.

The range of information technology degree programs offered at the Alpen-Adria-Universität Klagenfurt conveys the required skills and abilities. There are two engineering degrees: the Bachelor’s degree program *Information Technology* and the Master’s degree programme *Information and Communications Engineering*. The latter leads to the academic degree of Diplom-Ingenieur (Austrian university degree equivalent to Master of Engineering). Based on sound mathematical and technical foundations, the consecutive pursuit of the two degree programs delivers the expertise, skills and methodologies necessary for professional engineering activities. In addition to providing broad fundamental knowledge about the field, particular in-depth focus is placed on one particular area of information technology. The range of available courses, laboratories, and research and industrial placements reinforces the practical relevance of the degree programs. The technical content is supplemented by non-technical subjects designed to expand competencies and strengthen soft skills. The consideration of gender aspects helps to prepare graduates to make a substantial contribution to meeting the societal challenges posed by a society in transition to becoming more humane and gender-equitable.

Graduates completing the Master’s degree programme *Information and Communications Engineering* can work as developers of technical systems, or as product managers for suppliers to the automobile industry, chip manufacturers, software companies, and medical engineering businesses, to name a few examples. Business engineers hold professional functions in the sphere of corporate planning, production management, logistics, sales and marketing, as well as the rationalisation and restructuring of organisational processes. In view of the current exigencies of the internationally focused and increasingly networked area of production and service management, there is a particularly high demand for the interdisciplinary skill set of the business engineer, who can tackle technical problems in an integrative and consistent manner.

Extending beyond the fundamentals of the Bachelor’s degree program, graduates of the Master’s degree programme *Information and Communications Engineering* at Klagenfurt

University gain broad professional expertise and skills, as well as a scientific foundation in at least one branch of information technology (*learning outcomes*):

- *Professional skills and knowledge of the current state of the art in a branch of information technology*: Strongly research-led teaching in one of the branches of study available for selection by students introduces them to the state of the art in research and technology and empowers them to work scientifically in the chosen field in the context of their master thesis.
- *Individual and leadership competence*: Specially designed courses allow students to prepare for scientific work. In the light of the graduates' international occupational field and in order to reinforce their language skills, the courses in the Master's degree program are taught in English; students are further encouraged to write their master thesis in English. Gender knowledge and gender skills can be acquired by attending courses in the elective subject Feminist Science / Gender Studies (§ 9 Para. 4).
- *Practical or research experience and problem-solving skills*: Students are offered the opportunity to gather comprehensive project-related work experience in the course of a research or industrial placement. This provides intensive practical experience or impressions and experiences in research projects. Thus, graduates expand their expertise for solving large-scale problems in the field of business or administration, or for dealing with research questions in the academic sphere.
- *Scientific working methods*: Students deliver their first scientific contributions in the form of the research project and the master thesis, and are thus acquainted with working in a scientific manner. Graduates are qualified to pursue a doctoral degree.

(1) Branch of study Networks and Communications (NC)

The branch of study Networks and Communications serves to provide an academic education and qualification for professional activities in the development and operation of modern information and communication technologies, which require the application of scientific insights and methods. The course content encompasses both sound theoretical principles and practically relevant methodology. Furthermore, this branch of study provides the opportunity to gain expertise in areas of specialization, e.g. in the fields of embedded and ubiquitous systems, mobile and wireless networks, and self-organizing systems with applications in the areas of mobility and energy.

(2) Branch of study Autonomous Systems and Robotics (ASR)

The branch of study Autonomous Systems and Robotics serves to provide an academic education and qualification for professional activities in the development and operation of autonomous systems, which interact with their environment through mechatronic components, as well as covering the required scientific insights and methods. The course content encompasses both sound theoretical principles and practically relevant methodology. Furthermore, this branch of study provides the opportunity to gain expertise in areas of specialization, e.g. in the fields of autonomous robotics, driving assistance systems, self-propelled cars, networked sensor and actuator technology, networked control systems engineering and intelligent productions systems.

(3) Branch of study Business Engineering (BE)

The branch of study Business Engineering serves to provide an academic education and qualification for persons, who can combine technical expertise with sound economic

judgment. The program content focuses particularly on the application of integrated thinking to the analysis of problems and to the development of solutions to economic problems, which require the implementation of scientific insights and methods. Business engineers are expected, in particular, to establish connections between the discipline-specific modes of thinking and working, and are deployed to great effect in companies or organisations that deal with technological solutions from an economic perspective. Consequently, business engineers have access to a very broad occupational field.

### **§ 3 Admission Requirements**

The admission to a Master's degree program is conditional upon the successful completion of a relevant university-level Bachelor's degree or a relevant Bachelor's degree program at a University of Applied Sciences or other equivalent program at a recognised domestic or foreign post-secondary educational institution. In the event that equivalence has been established in principle and only certain supplementary qualifications are required for full equivalence, the Rectorate shall be entitled to tie the determination of equivalence to examinations sat during the respective Master's degree program (§ 64 Para. 5 UA).

The Bachelor's degree program *Information Technology* at Klagenfurt University qualifies as relevant in any case.

### **§ 4 Academic Degree**

Graduates of this Master's degree program are awarded the academic degree "Diplom-Ingenieurin/Diplom-Ingenieur" (abbreviated to "Dipl.-Ing." or "DI" and equivalent to "Master of Engineering"). When used, the academic degree must precede the name.

### **§ 5 Structure and Organisation of the Degree Program**

- (1) Within the scope of the Master's degree programme *Information and Communications Engineering*, students must complete the compulsory courses from one of the three branches of study, the restricted electives in the respective branch of study, and the free electives. In addition, they must write a master thesis (including a "Privatissimum" research seminar). Tables 1 to 3 depict the structure and the composition of the Master's degree program for each branch of study.
- (2) Students who are unable to demonstrate that they have acquired the full scope of the required basic business knowledge (especially the successful completion of courses in subject "9(a) Fundamental Topics in Business Sciences" from the Bachelor's degree program *Information Technology*) have the opportunity to complete the branch of study Business Engineering. After consultation with the program director, these students must acquire the missing fundamental topics in the context of the restricted electives "3.3b Management and Economics: Basic Courses" and "3.5 Soft Skills" (cf. § 9).

Table 1: List of subjects in the branch of study Networks and Communications (NC)

	Subject Area	Intended Learning Outcomes	ECTS credits
Compulsory subjects	<p>1.1 Networks and Communications: Fundamentals -- “NC-Fundamentals” (Networks and Communications: Fundamental Topics)</p> <p>Note: The list of courses for this subject 1.1 is provided in Table 4.</p>	<ul style="list-style-type: none"> <li>- Present and explain basic methodological principles in the field of the branch of study Networks and Communications.</li> <li>- Compare and contrast advantages and disadvantages of different communication technologies.</li> <li>- Identify characteristics of specific communications networks and applications (e.g. mobile communication, sensor networks, Internet of Things).</li> </ul>	12
Restricted electives	<p>1.2 Networks and Communications: Advanced -- “NC-Advanced” (Networks and Communications: Specialist Courses)</p> <p>Note: The structure of subject 1.2 is described in Table 7a. Refer to APPENDIX 2 for the applicable catalogue of courses.</p>	<ul style="list-style-type: none"> <li>- Apply skills acquired in 1.1 to practical tasks.</li> <li>- Select and adapt suitable methods and technologies for various types of network architecture.</li> <li>- Research, discuss and present the state of the art in one subsection of the subject.</li> </ul>	30
	<p>1.3 Information and Communications Engineering: Supplements -- „ICE-Supplements” (Information Technology Supplementary Courses)</p> <p>Note: The structure of subject 1.3 is described in Table 8. Refer to APPENDIX 4 for the applicable catalogue of courses.</p>	<ul style="list-style-type: none"> <li>- Focused specialisation and/or expansion of personal professional skills and expertise in accordance with individual interests.</li> </ul>	18
	<p>1.4 Technical Complementary Courses -- „TE-Complementary“ (Technical Complementary Courses) (incl. optional research or industrial placement (6 ECTS))</p> <p>Note: The structure of subject 1.4 is described in Table 9. Refer to APPENDIX 5 for the applicable catalogue of courses.</p>	<ul style="list-style-type: none"> <li>- Focused specialisation and/or expansion of personal professional skills in accordance with individual interests, reaching beyond the borders of the student’s own area of specialisation.</li> <li>- Develop problem-solving solutions for scientific problems under expert supervision.</li> <li>- Prepare a report detailing the results of research activities.</li> </ul>	12
	<p>1.5 Soft Skills (Expansion of Skills)</p>	<ul style="list-style-type: none"> <li>- Targeted expansion of personal skills in accordance with individual interests,</li> </ul>	12



	Note: The structure of subject 1.5 and the areas with recommended courses are described in § 9 Section 8.	particularly with respect to soft skills, gender studies and technology assessment.	
Free electives	1.6 Free Electives	- Targeted expansion of personal skills in accordance with individual interests.	6
Master thesis	1.7 Master thesis (from ASR or NC) (Master thesis including Privatissimum research seminar)	- Research and discuss the state of the art in one subsection of the subject. - Identify specific problems within the state of the art. - Design problem-solving approaches for specific problems. - Implement and validate problem-solving approaches. - Prepare a report detailing the results of research activities.	30
			Total: 120

*Table 2: List of subjects in the branch of study Autonomous Systems and Robotics (ASR)*

	Subject Area	Intended Learning Outcomes	ECTS credits
Compulsory subjects	2.1 Autonomous Systems and Robotics: Fundamentals -- „ASR-Fundamentals” (Autonomous Systems and Robotics: Fundamental Topics)  Note: The list of courses for this subject 2.1 is provided in Table 5.	- Present and explain basic methodological principles in the field of Autonomous Systems and Robotics. - Explain fundamental concepts and methods for the control systems engineering of networked systems. - Identify advantages and disadvantages of different sensor and actuator technologies in a variety of application settings. - Identify special requirements with regard to sensor technology, actuator technology and control systems engineering.	12
Restricted electives	2.2 Autonomous Systems and Robotics: Advanced -- „ASR-Advanced” (Autonomous Systems and Robotics: Specialist Courses)  Note: The structure of subject 2.2 is described in Table 7b. Refer to APPENDIX 3 for the applicable catalogue of courses.	- Apply skills acquired in 2.1 to practical tasks. - Select and adapt suitable methods and technologies for autonomous systems or robotics applications. - Research, discuss and present the state of the art in one subsection of the subject.	30
	2.3 Information and Communications Engineering:	- Focused specialisation and/or expansion of personal	18

	Supplements -- „ICE-Supplements” (Information Technology Supplementary Courses)  Note: The structure of subject 2.3 is described in Table 8. Refer to APPENDIX 4 for the applicable catalogue of courses.	professional skills and expertise in accordance with individual interests.	
	2.4 Technical Complementary Courses -- „TE-Complementary“ (Technical Complementary Courses) (incl. optional research or industrial placement (6 ECTS))  Note: The structure of subject 2.4 is described in Table 9. Refer to APPENDIX 5 for the applicable catalogue of courses.	<ul style="list-style-type: none"> <li>- Focused specialisation and/or expansion of personal professional skills in accordance with individual interests, reaching beyond the borders of the student’s own area of specialisation.</li> <li>- Develop problem-solving solutions for scientific problems under expert supervision.</li> <li>- Prepare a report detailing the results of research activities.</li> </ul>	12
	2.5 Soft Skills (Expansion of Skills)  Note: The structure of subject 2.5 and the areas with recommended courses are described in § 9 Section 8.	<ul style="list-style-type: none"> <li>- Targeted expansion of personal skills in accordance with individual interests, particularly with respect to soft skills, gender studies and technology assessment.</li> </ul>	12
Free electives	2.6 Free Electives	<ul style="list-style-type: none"> <li>- Targeted expansion of personal skills in accordance with individual interests.</li> </ul>	6
Master thesis	2.7 Master thesis (from ASR or NC) (Master thesis including Privatissimum research seminar)	<ul style="list-style-type: none"> <li>- Research and discuss the state of the art in one subsection of the subject.</li> <li>- Identify specific problems within the state of the art.</li> <li>- Design problem-solving approaches for specific problems.</li> <li>- Implement and validate problem-solving approaches.</li> <li>- Prepare a report detailing the results of research activities.</li> </ul>	30
			Total: 120

*Table 3: List of subjects in the branch of study Business Engineering*

	Subject Area	Intended Learning Outcomes	ECTS credits
Compulsory subjects	3.1 Management and Economics: Fundamentals -- „BE-Fundamentals“  Note: The list of courses for	<ul style="list-style-type: none"> <li>- Acquire knowledge of the professional and methodological principles of decision-oriented business management and the relevant</li> </ul>	8

	this subject 3.1 is provided in Table 6.	areas of economics.	
Restricted electives	3.2 Management and Economics: Advanced -- „BE-Advanced“  Note: The structure of subject 3.2 is described in Table 7c. Refer to APPENDIX 6 for the applicable catalogue of courses.	- Further extend and apply skills acquired in 3.1 to selected areas of business management. - Select suitable methods and processes for problem analysis and the design and assessment of problem solutions in the fields of Entrepreneurship & Innovation Management, Operational Management and Supply Chain Management, Controlling and Strategic Management, as well as Energy and Environmental Economics.	20
	3.3a Management and Law: Complementary Courses <sup>1</sup>  Note: Refer to APPENDIX 7 for the applicable catalogue of courses.	- Focused expansion of skills and expertise in accordance with individual interests.	8
	OR		
	3.3b Management and Economics: Basic Courses <sup>2</sup>  Note: Refer to APPENDIX 8 for the applicable catalogue of courses.	- Knowledge of the fundamental principles and knowledge required for subjects 3.1 and 3.2.	
	3.4a Networks and Communications (Subjects 1.1. and 1.2)  OR	- Refer to description in Table 1.	42
	3.4b Autonomous Systems and Robotics (Subjects 2.1 and 2.2)	- Refer to description in Table 2.	
3.5 Soft Skills <sup>3</sup> (Expansion of Skills)  Note: The structure of subject 3.5 and the areas with recommended courses are described in § 9 (8).	- Targeted expansion of personal skills in accordance with individual interests.	6	
Free electives	3.6 Free Electives	- Targeted expansion of personal skills in accordance with individual interests, particularly with respect to	6

<sup>1</sup> This only applies to students who are able to demonstrate relevant prior knowledge of Business Management in accordance with § 5 Para. 2.

<sup>2</sup> This only applies to students who are not able to demonstrate relevant prior knowledge of Business Management in accordance with § 5 Para. 2.

<sup>3</sup> For this subject, students who are not able to demonstrate relevant prior knowledge of Business Management in accordance with § 5 Para. 2 must select additional courses from the catalogue „Management and Economics: Basic Courses“ worth 6 ECTS credits.

		soft skills, gender studies and technology assessment.	
Master thesis	2.7 Master thesis (from ASR or NC) (Master thesis including Privatissimum research seminar)	<ul style="list-style-type: none"> <li>- Research and discuss the state of the art in one subsection of the subject.</li> <li>- Identify specific problems within the state of the art.</li> <li>- Design problem-solving approaches for specific problems.</li> <li>- Implement and validate problem-solving approaches.</li> <li>- Prepare a report detailing the results of research activities.</li> </ul>	30
			Total: 120

## § 6 Studying Abroad / Mobility

It is principally recommended that students spend at least one semester abroad. In accordance with § 78 Para. 1 UA and provided that the equivalence can be established, examinations successfully completed at foreign universities can be recognised in the place of examinations prescribed by the curriculum. The window of mobility for a period spent abroad should be scheduled to take place after the courses in the compulsory subjects have been successfully completed. It is further recommended that students obtain a “pre-notification” from the program director in advance of the period abroad in accordance with § 78 Para. 5 UA.

## § 7 Types of Courses

- (1) Lectures (VO) are courses in which the instructors convey knowledge by lecturing. The course is concluded with a single (written and/or oral) examination.
- (2) Courses with an immanent examination character are courses in which the assessment is not based on a single examination, but rather is based on the written and/or oral contributions of the participants during the course or - in the case of scientific papers or projects (seminar papers or papers requiring an equivalent effort) - no later than the end of the semester following the semester in which the course is held. The following are courses with an immanent examination character:
  - (a) Lecture with course (German abbrev. VK): Courses of this type are comprised of a lecture part and a course part, which have close didactic links and are assessed jointly.
  - (b) Course (German abbrev. KU): These are courses in which students and instructors work together on the subject matter in an experience-based and application-oriented way. In particular, courses serve to convey and expand skills required to solve specific problems.
  - (c) Exercise (German abbrev. UE): Exercises serve to solve concrete tasks in order to reinforce the content of the lecture.
  - (d) Practical placement (German abbrev. PR): In addition to providing an academic education and qualification for professional activities, research and industrial placements serve to achieve the practical-professional objectives of the degree

program. Special emphasis is placed on using the opportunity to work on concrete tasks and projects. During a practical placement, small research or development projects are carried out - preferably in teams - with due consideration to all required work stages. The completion of a written paper documenting the project progression and the project results are an inherent element of the placement.

- (e) Seminar (SE): Seminars serve the purpose of reflection and discussion of specific scientific problems and/or scientific papers. Participants make their own written and oral contributions. Seminar papers must be produced independently and must comply with good scientific practise in terms of form and content.
- (f) Research Seminar / Privatissimum (German abbrev. PV): A Privatissimum is a specially designed research seminar, which serves to prepare students for the master thesis or which provides guidance throughout the process of writing the master thesis.

## § 8 Courses in Compulsory Subjects

(1) Compulsory subjects are subjects, which characterise the degree program, and which are concluded by an examination. If selected courses pertaining to the compulsory subjects have already been completed in the context of the Bachelor's degree program, alternative courses must be chosen from the restricted electives in consultation with the program director. The selection must be made from the following subjects:

- "1.2 Networks and Communications: Advanced" for the branch of study Networks and Communications
- "2.2 Autonomous Systems and Robotics: Advanced" for the branch of study Autonomous Systems and Robotics
- "3.2 Management and Economics: Advanced" for the branch of study Business Engineering

(2) The courses for the compulsory subjects in the branch of study Networks and Communication (NC) are listed in Table 4.

*Table 4: List of courses for the compulsory subjects in the branch of study Networks and Communication (NC)*

	<i>Course title</i>	<i>Type of course</i>	<i>ECTS credits</i>
<i>1.1 Networks and Communications: Fundamentals</i>	<i>Mobile Communications</i>	VK	4
	<i>Signal Processing for Communications</i>	VK	4
	<i>Sensor Networks</i>	VK	4
			Total: 12

- (3) The courses for the compulsory subjects in the branch of study Autonomous Systems and Robotics (ASR) are listed in Table 5.

*Table 5: List of courses for the compulsory subjects in the branch of study Autonomous Systems and Robotics (ASR)*

	<i>Course title</i>	<i>Type of course</i>	<i>ECTS credits</i>
<i>2.1 Autonomous Systems and Robotics: Fundamentals</i>	<i>Robotics</i>	VK	4
	<i>Sensors and Actuators</i>	VK	4
	<i>Control of Autonomous Systems</i>	VK	4
			Total: 12

- (4) The courses for the compulsory subjects in the branch of study Business Engineering (BE) are listed in Table 6.

*Table 6: List of courses for the compulsory subjects in the branch of study Business Engineering (BE)*

	<i>Course title</i>	<i>Type of course</i>	<i>ECTS credits</i>
<i>3.1 Management and Economics: Fundamentals</i>	<i>Value based Management</i>	VK	2
	<i>Operational Management and Logistics</i>	VK	2
	<i>Energy Economics: Theory and policy</i>	VO	4
			Total: 8

## **§ 9 Courses in the Subjects of the Restricted Electives**

- (1) Restricted electives are those subjects, in which students can select from the subjects listed in the curriculum or from the lists of subjects provided. These correspond to the restricted electives listed in Tables 1, 2 and 3. Please refer to Tables 7a, 7b, 7c, 8 and 9 as well as § 9 Para. 8 for the respective lists of courses.
- (2) In the branches of study Networks and Communications (NC) and Autonomous Systems and Robotics (ASR), students must gain a total of 72 ECTS credits in restricted

electives respectively (see subjects „1.2 Networks and Communications: Advanced“, „1.3 Information and Communications Engineering: Supplements“, „1.4 Technical Complements“ and „1.5 Soft Skills“ in Table 1 or, respectively, „2.2 Autonomous Systems and Robotics: Advanced“, „2.3 Information and Communications Engineering: Supplements“, „2.4 Technical Complements“ and „2.5 Soft Skills“ in Table 2). In the branch of study Business Engineering students must gain a total of 76 ECTS credits in restricted electives (see subjects „3.2 Management and Economics: Advanced“, „3.3a Management and Law: Complements“ or „3.3b Management and Economics: Basic Courses“, „3.4a Networks and Communications“ or “3.4b Autonomous Systems and Robotics” and “3.5 Soft Skills” in Table 3).

- (3) Table 7a describes the composition of the courses for the restricted electives “1.2 Networks and Communications: Advanced“ (NC-Advanced). A sample course list for this restricted elective is included as attachment (see APPENDIX 2).

*Table 7a: Structure of the restricted electives „1.2 Networks and Communications: Advanced“ (NC-Advanced)*

	Course title	Type of course	ECTS credits
Restricted electives „NC-Advanced“  Note: Refer to APPENDIX 2 for the course catalogue.	(1.2.1) Selection from the course catalogue „1.2 Networks and Communications: Advanced“ (NC-Advanced)	VK/VO	16
	(1.2.2) Selection from the course catalogue „1.2 Networks and Communications: Advanced“ (NC-Advanced)	KU	6
	(1.2.3) Selection from the course catalogue „1.2 Networks and Communications: Advanced“ (NC-Advanced)	VK/VO/KU	8
			Total: 30

- (4) Table 7b describes the composition of the courses for the restricted electives “2.2 Autonomous Systems and Robotics: Advanced“ (ASR-Advanced). A sample course list for this restricted elective is included as attachment (see APPENDIX 3).

Table 7b: Structure of the restricted electives „2.2 Autonomous Systems and Robotics: Advanced“ (ASR-Advanced)

	Course title	Type of course	ECTS credits
Restricted electives „ASR-Advanced“  Note: Refer to APPENDIX 3 for the course catalogue.	(2.2.1) Selection from the course catalogue “2.2 Autonomous Systems and Robotics: Advanced“ (ASR-Advanced)	VK/VO	16
	(2.2.2) Selection from the course catalogue “2.2 Autonomous Systems and Robotics: Advanced“ (ASR-Advanced)	KU	6
	(2.2.3) Selection from the course catalogue “2.2 Autonomous Systems and Robotics: Advanced“ (ASR-Advanced)	VK/VO/KU	8
			Total: 30

(5) Table 7c describes the composition of the courses for the restricted electives “3.2 Management and Economics: Advanced“ (BE-Advanced). Students must select two out of a total of four course catalogues (WIWI-1, WIWI-2, WIWI-3, and WIWI-4). Within each of these two catalogues, students must complete courses worth 10 ECTS credits. A sample course list for this restricted elective is included as attachment (see APPENDIX 6).

Table 7c: Structure of the restricted electives „3.2 Management and Economics: Advanced“ (BE-Advanced)

	Course title	Type of course	ECTS credits
Restricted electives „BE-	(3.2.1.) Course selection from	VK/VO/KU	10



<p>Advanced“ (Choice of 2 blocks)</p> <p>Note: Refer to APPENDIX 6 for the course catalogue.</p>	<p><i>the WiWi area Entrepreneurship &amp; Innovation Management (course catalogue WIWI- 1)</i></p>		
	<p><i>(3.2.2.) Course selection from the WiWi area Operational Management &amp; Supply Chain Management (course catalogue WIWI- 2)</i></p>	VK/VO/KU	10
	<p><i>(3.2.3.) Course selection from the WiWi area Controlling and Strategic Corporate Leadership (course catalogue WIWI- 3)</i></p>	VK/VO/KU	10
	<p><i>(3.2.4.) Course selection from the WiWi area Energy and Environmental Economics (course catalogue WIWI- 4)</i></p>	VK/VO/KU	10

(6) Table 8 describes the composition of the courses for the restricted electives “1.3/2.3 Information and Communications Engineering: Supplements“ (ICE-Supplements). A sample course list for this restricted elective is included as attachment (see APPENDIX 4).

*Table 8: Structure of the restricted electives “1.3/2.3 Information and Communications Engineering: Supplements“ (ICE-Supplements)*

	Course title	Type of course	ECTS credits
Restricted electives „ICE- Supplements“  Note: Refer to APPENDIX 4 for the course catalogue.	(1.3.1) / (2.3.1) <b>Research            Seminar from            one area of            Information            Technology (see            course            catalogue ICE-            Supplements)</b>	SE	4
	(1.3.2) / (2.3.1) Selection from the course catalogue „1.3 Information and Communications Engineering: Supplements“ (ICE- Supplements)	VK/VO/KU	14
			Total: 18

(7) Table 9 describes the composition of the courses for the restricted electives “1.4/2.4 Technical Complements” (TE-Complements). A sample course list for this restricted elective is included as attachment (see APPENDIX 5).

*Table 9: Structure of the restricted electives “1.4/2.4 Technical Complements” (TE-Complements)*

	Course title	Type of course	ECTS credits
Restricted electives „ICE- Supplements“  Note: Refer to APPENDIX 5 for the course catalogue.	(1.4.1) / (2.4.1) Selection from the course catalogue “1.4/2.4 Technical Complements“ (TE- Complements)	VK/VO/KU	12
	(1.4.2) / (2.4.1) <u>optional</u> research	KU/PV	

	placement (Research Project) worth 6 ECTS credits  <u>OR</u>  <u>optional</u> industrial placement worth 6 ECTS credits (cf. §13)		
			Total: 12

(8) To ensure a broad interdisciplinary qualification, particularly in reinforcement of language and social skills, as well as team and leadership skills, students must select courses worth at least 12 ECTS credits for the branches of study ASR and NC or 6 ECTS credits for the branch of study BE from the following areas (Subject Soft Skills (Skill Expansion) 1.5, 2.5 or 3.5):

a) Feminist Science / Gender Studies: Gender and Technology

or

b) A selection of courses from the following areas:

(b.1) Interdisciplinary Science and Technology Studies

(b.2) German communication and language skills

(b.3) English communication and language skills

(b.4) Entrepreneurship and Innovation Management

(b.5) Team and leadership skills

(b.6) Legal Foundations

(b.7) Privatissimum research seminar accompanying the placement (in the context of the subject „Soft Skills“ this option is only available to students in the branch of study Business Engineering)

Note: Please refer to APPENDIX 9 for the course catalogue.

Students in the branch of study Business Engineering can complete a relevant placement worth 6 ECTS credits in line with § 13 (see Para. 8 (b.7)).

For this subject, students in the branch of study Business Engineering, who are not able to demonstrate relevant prior knowledge of Business Management in accordance with § 5 Para. 2, must select additional courses from the catalogue „Management and Economics: Basic Courses“ (refer to APPENDIX 8) worth 6 ECTS credits.

(9) Once every year, the composition of the catalogues of restricted electives „1.2, 1.3, 1.4, 1.5“; „2.2, 2.3, 2.4, 2.5“, and „3.2, 3.3a, 3.3b, 3.5“ is established by the program director following consultation with the competent professors or areas of

study (Information Technology, Mathematics, Informatics, and Business Engineering), giving particular consideration to the feasibility of studying, and they are recorded in the online registration system. A complete set of catalogues can be found in the Appendices.

- (10) Any surplus ECTS credits from the restricted electives can be added to the free electives.

## **§ 10 Free Electives**

The term free electives describes those subjects, which students can select freely from the range of courses offered by domestic and foreign universities. They correspond to the free electives listed in Tables 1, 2, and 3. Courses completed in order to gain the entitlement to study at a university, or the general or special university entrance qualification, are excluded. Students must complete free electives worth 6 ECTS credits.

## **§ 11 Courses with Limited Numbers of Participants**

- (1) All courses endowed with an immanent examination character are limited to a total number of persons not exceeding 30 participants.
- (2) If the number of students registering for these courses exceeds the number of available places, students are admitted in accordance with the following procedure:
  - All possible participants are ranked according to points awarded. All examination results obtained in courses in the Master's degree program are taken into consideration. In the case of courses, which are open to students both from the Bachelor's and the Master's degree program, the compulsory subjects completed by Master's students during their Bachelor's degree also enter into the calculation.
  - The formula for points achieved in a course is:  $(5 - \text{examination grade}) \times \text{„number of ECTS credits in this course“}$ .
  - These points are added together. Students with a higher number of points are given preference. In the case of a tie, the decision is made by the drawing of lots.

## **§ 12 Master Thesis**

- (1) The term master thesis refers to the academic paper, which serves to demonstrate students' ability to achieve adequate standards of content and methodology when independently addressing scholarly topics. The assignments for the master theses shall be chosen in such a way that it is feasible and reasonable to expect students to complete them within six months. A number of students may jointly address a topic, provided that the performance of each individual student can be assessed.
- (2) The topic of the master thesis must be selected from one of the compulsory subjects (acc. to § 8) of the two branches of study Networks and Communications or Autonomous Systems and Robotics, or must be classified relevant to the respective branch of study. In the branch of study Business Engineering the topic of the master thesis can also be chosen from the compulsory subject of this branch, or be classified as relevant to it.

- (3) The master thesis including the relevant Privatissimum research seminar (worth 6 ECTS credits) accounts for 30 ECTS credits.
- (4) In accordance with Part B § 18 of the University Statutes, the student must provide the Rector of Studies with written notice of the topic and the supervisor of the master thesis prior to commencing work on the thesis. The topic and the supervisor are deemed to have been accepted, if the Rector of Studies does not issue a notice of prohibition within one month after receipt of the student's notice. A change of supervisor is admissible up to the submission of the master thesis.
- (5) The completed master thesis shall be submitted to the Rector of Studies in printed and in electronically readable form for the purpose of assessment. More specific instructions in this regard are decreed by the Rector of Studies with due consideration of the state of technological development. The supervisor shall assess the master thesis within two months from the time of submission.

### **§ 13 Provisions Regarding the Completion of a Relevant Placement**

- (1) To reinforce the practical and research experience as well as the problem-solving skills, students can complete either a research or an industrial placement (worth 6 ECTS credits respectively) as part of the restricted elective "1.4/2.4 Technical Complements" (for the branches of study NC and ASR), or "3.5 Soft Skills" (for the branch of study BE).
- (2) During a research or industrial placement, students work on a project, defined in advance, under the expert supervision of a university lecturer. The industrial placement can be completed in a company, with a public administrative body, a non-profit organisation, or a non-university research institution, and must last at least 2 months. Research placements are completed at a university.
- (3) The industrial placement is assessed through the course "Privatissimum accompanying the placement" (6 ECTS credits), the assessment of the research placement is carried out through the respective "research project" course (6 ECTS credits).

### **§ 14 Use of Languages other than German**

The Master's degree programme *Information and Communications Engineering* is taught in English. It is expressly recommended that students in all three branches of study write the master theses in English.

### **§ 15 Examination Regulations**

- (1) The Master's degree programme *Information and Communications Engineering* is concluded by the successful completion of the following parts:
  - a) the courses pertaining to the compulsory subjects, the restricted electives, and the electives (§§ 8-10),
  - b) the master thesis and the accompanying Privatissimum research seminar acc. to § 12, as well as
  - c) the general concluding examination by committee acc. to § 15 Para. 3.

- (2) The registration to take the general concluding examination by committee is conditional upon the positive completion of the parts listed in paragraph 1 (a) and paragraph 1 (b).
- (3) The general concluding examination is conducted as an oral examination by an examination committee consisting of three persons, and generally lasts one hour. The general examination by committee comprises
  - a) the presentation and defence of the master thesis, and
  - b) an examination covering one subject area from subjects 1.1 and 1.2 (for the branch of study NC), or respectively from subjects 2.1 and 2.2 (for the branch of study ASR), or from subjects 3.1, 3.2 as well as 3.4a and 3.4b (for the branch of study BE).
- (4) Any examinations taken as part of a previously completed degree program, which served to qualify students for admission to the Master's degree program, cannot be considered again and therefore these examinations do not count towards obtaining the Master's degree.
- (5) The overall assessment (§ 73 Para. 3 UA) shall be worded "pass", if every examination subject has been passed successfully, and otherwise shall be "fail". The overall assessment shall be worded "passed with distinction", if the grade is no worse than "good" in any subject, and if the grades in at least half of the subjects are "very good".

## **§ 16 Effective Validity**

This curriculum comes into force on the 1<sup>st</sup> of October 2015 following formal announcement in the University Bulletin of Klagenfurt University, and applies to all students who commence their Master's degree program from winter semester 2015 onwards.

## **§ 17 Transitional Provisions**

- (1) Students enrolled in the Master's degree program *Information Technology* prior to the winter semester of 2015, are entitled to complete these studies under the hitherto applicable provisions within a time frame consisting of the scheduled study period plus one semester, i.e. no later than the 30<sup>th</sup> April 2018. If the degree program is not completed on time, the student has to pursue her/his studies according to the provisions of the curriculum for the Master's degree programme *Information and Communications Engineering*. Furthermore, students are entitled to voluntarily transition to the provisions of this curriculum at any point in time.
- (2) Please refer to APPENDIX 1 (Equivalence Table) for the specific provisions regarding the equivalence of examinations assessed positively under the hitherto applicable curriculum for the Master's degree program *Information Technology* and those under the curriculum for the Master's degree programme *Information and Communications Engineering*.

**APPENDIX 1: Equivalence Table for the transition from the Master’s degree program “Information Technology (2009)” to “Information and Communications Engineering - ICE (2015)”**

Information Technology (2009)	Course Type	ECTS credits	Information and Communication Engineering (2015)	Course Type	ECTS credits
(1) Subject “Technical Specialisation” (2) Subject “Technical Supplement I” (3) Subject “Technical Supplement II”			Suitable subjects available for assignment		
Course type VK/VS	VK/VS	4	Branch of study NC: • Subject 1.1 or 1.2 or 1.3 or 1.4 Branch of study ASR: • Subject 2.1 or 2.2 or 2.3 or 2.4 Branch of study BE: • Subject 3.4	VK/VS	4
Course type KU or PR	KU	3	Branch of study NC: • Subject 1.2 or 1.3 or 1.4 Branch of study ASR: • Subject 2.2 or 2.3 or 2.4 Branch of study BE: Subject 3.4	KU	3
Course type SE	SE	4 or 6	Branch of study NC: • Subject 1.2 or 1.3 or 1.4 Branch of study ASR: • Subject 2.2 or 2.3 or 2.4 Branch of study BE: Subject 3.4	SE	4 or 6
(4) Subject “Methodological Specialisation”			Suitable subjects available for assignment		
(4’) Research Track: Course type VO or VK or VS or KU or PR	VO/VK/VS/KU/PR	3 or 4 or 6	Branch of study NC: • Subject 1.2 or 1.3 or 1.4 Branch of study ASR: • Subject 2.2 or 2.3 or	VO/VK/VS/KU/PR/SE	3 or 4 or 6

			2.4 Branch of study BE: Subject 3.4		
(4'') Entrepreneurship Track: Course type VO or VK or VS or SE or KU or PR	VO/VK /VS/KU/PR/SE	3 or 4 or 6	Branch of study BE: • Subject 3.1 or 3.2 or 3.3 Branch of study NC: • Subject 1.5 or 1.6 Branch of study ASR: • Subject 2.5 or 2.6	VO/VK/VS/KU/PR/SE	3 or 4 or 6
(4''') Industrial Track: Placement or industrial placement (KU with 18 ECTS credits)  or  (4') Research Track: Research project (KU with 12 ECTS credits)	KU	18	Branch of study NC: • (a) KU "Privatissimum accompanying the placement (6 ECTS credits)" in subject 1.4 • (b) The surplus is added to subject 1.6 "Free Electives" Branch of study ASR: • (a) KU "Privatissimum accompanying the placement (6 ECTS credits)" in subject 2.4 • (b) The surplus is added to subject 2.6 "Free Electives" Branch of study BE: • (a) KU "Privatissimum accompanying the placement (6 ECTS credits)" in subject 3.5 • (b) The surplus is added to subject 3.6 "Free Electives"	KU (a) KU (b) KU	(a) 6 (b) 6
(5) Expansion of Skills			Suitable subjects available for assignment		
Course type VO or VK or VS or SE or KU or PR	VO/VK /VS/KU/PR/SE	2 or 3 or 4 or 6	Branch of study NC: • Subject 1.5 Branch of study ASR: • Subject 2.5 Branch of study BE: Subject 3.5	VO/VK/VS/KU/PR/SE	2 or 3 or 4 or 6
(6) Free Electives			Suitable subjects available for assignment		
Course type VO or VK or VS or SE or KU or PR	VO/VK /VS/KU/PR/	2 or 3 or 4 or	Branch of study NC: • Subject 1.6	VO/VK/VS/KU/	2 or 3 or 4 or 6



	SE	6	Branch of study ASR: • Subject 2.6 Branch of study BE: Subject 3.6	PR/SE	
(7) Master Thesis			Master Thesis		
(7.1) Master Thesis	VO	24	Master Thesis		24
(7.2) Privatisimum accompanying the master thesis	SE/PV	6	Privatisimum accompanying the master thesis	SE/PV	6

**APPENDIX 2: Courses in the restricted elective “1.2 Networks and Communications: Advanced (NC-Advanced)” (Example)**

	Course title	Type of course	ECTS credits
1.2. Networks and Communications: Advanced  (NC-Advanced)	<i>Wireless Networks</i>	VK	4
	<i>Power Line Communications</i>	VK	4
	<i>Pervasive Computing</i>	VK	4
	<i>Smart Grids</i>	VK	4
	<i>Multimedia Systems</i>	VK	4
	<i>Advanced Wireless Communications</i>	VK	4
	<i>Information Theory</i>	VK	4
	<i>Simulation of Networked Systems</i>	VK	4
	<i>Sensor Networks</i>	KU	3
	<i>Mobile Communications</i>	KU	3
	<i>Signal Processing for Communications</i>	KU	3
	<i>Wireless Networks</i>	KU	3

**APPENDIX 3: Courses in the restricted elective “2.2 Autonomous Systems and Robotics: Advanced (ASR-Advanced)” (Example)**

	Course title	Type of course	ECTS credits
2.2. Autonomous Systems and Robotics: Advanced  <i>(ASR-Advanced)</i>	<i>Measurements Signal Processing</i>	VK	4
	<i>Robust Design and Reliability</i>	VK	4
	<i>CAE of Mechatronics Systems</i>	VK	4
	<i>State Estimation of Robotics Systems</i>	VK	4
	<i>Vision and INS based Navigation</i>	VK	4
	<i>Pattern Recognition in Intelligent Vehicles</i>	VK	4
	<i>Systems Science and Neurocomputing</i>	VK	4
	<i>Machine Vision in Intelligent Transportation Systems</i>	VK	4
	<i>Measurements Signal Processing</i>	KU	3
	<i>Robust Design and Reliability</i>	KU	3
	<i>CAE of Mechatronics Systems</i>	KU	3
	<i>Lab State Estimation of Robotics Systems</i>	KU	3
	<i>Lab Vision and INS based Navigation</i>	KU	3
	<i>Lab Smart Sensors and Machine Vision in Intelligent Vehicles</i>	KU	3
	<i>Lab Dynamic Systems and Neurocomputing</i>	KU	3
	<i>Lab Methods of ITS (Intelligent Transportation Systems)</i>	KU	3

**APPENDIX 4: Courses in the restricted elective “1.3/2.3 Information and Communications Engineering: Supplements (ICE-Supplements)” (Example)**

	Course title (resp. catalogue) for the ICE-Supplements catalogue	Type of course	ECTS credits
(1.3.1) / (2.3.1)  Choice of <u>one</u> Research Seminar from the field of Information Technology	<i>Research Seminar in Mobile Systems</i>	SE	4
	<i>Research Seminar in Pervasive Computing</i>	SE	
	<i>Research Seminar in Embedded Communications</i>	SE	
	<i>Research Seminar in Sensors and Actuators</i>	SE	
	<i>Research Seminar in Smart Grids</i>	SE	
	<i>Research Seminar in Control of Networked Systems</i>	SE	
	<i>Research Seminar in Intelligent Transportation Systems</i>	SE	
(1.3.2) / (2.3.2)  Choice of courses from the list provided	Courses from the catalogue ASR-Advanced, see APPENDIX 3	VK/VO/KU	14
	Courses from the catalogue NC-Advanced, see APPENDIX 2	VK/VO/KU	
	<i>Digital Signal Processors</i>	VK	
	<i>Digital Signal Processors</i>	KU	
	<i>Pervasive Computing</i>	KU	
	<i>Artificial Vision</i>	VK	
	<i>Modeling and Simulation of Energy Systems</i>	VK	
	<i>Fundamentals of Image Processing</i>	VK	
	<i>Fundamentals of Image Processing</i>	KU	
	<i>Traffic Telematics</i>	VK	
	<i>GIS and Smart Maps</i>	KU	
	<i>Traffic Simulation Lab</i>	KU	
	<i>Mobile Applications with Androids</i>	VK	
	<i>Artificial Intelligence</i>	VK	
	<i>Systems Security</i>	VK	
<i>Systems Security</i>	KU		

**APPENDIX 5: Courses in the restricted elective “1.4 Technical Complements (TE-Complements)” (Example)**

	Course title (resp. catalogue) for the TE-Complements catalogue	Type of course	ECTS credits
(1.4.1) / (2.4.1)  Choice of courses from the list provided	Selected courses from the field of Informatics	VK/KU	6 / 12
	Selected courses from the field of Mathematics	VK/KU	
	Courses from the catalogue ASR-Advanced, see APPENDIX 3	VK/KU	
	Courses from the catalogue NC-Advanced, see APPENDIX 2	VK/KU	
	Courses from the catalogue ICE-Supplements, see APPENDIX 4	VK/KU	
(1.4.2) / (2.4.2)  <u>optional</u> research placement (Research Project) worth 6 ECTS credits  <u>OR</u>  <u>optional</u> industrial placement worth 6 ECTS credits (cf. §13)	Privatissimum accompanying the placement	PV	6 / 0
	<i>Research Project in Mobile Systems</i>	KU	
	<i>Research Project in Pervasive Computing</i>	KU	
	<i>Research Project in Embedded Communications</i>	KU	
	<i>Research Project in Smart Grids</i>	KU	
	<i>Research Project in Sensors and Actuators</i>	KU	
	<i>Research Project in Control of Networked Systems</i>	KU	
	<i>Research Project in Intelligent Transportation Systems</i>	KU	
			Total: 12

**APPENDIX 6: Courses in the restricted elective “3.2 Management and Economics: Advanced (BE-Advanced)” (Example)**

The student shall select two of the four available catalogues (WIWI.1 to WIWI-4) and complete all respective courses.

**A. Entrepreneurship resp. Innovation Management (WIWI-1)**

	Course title	Type of course	ECTS credits
3.2.1 Course selection from the WIWI field Entrepreneurship resp. Innovation Management (Language of instruction German, with some courses taught in English)	<i>Entrepreneurship &amp; Innovation Management</i>	KV	4
	Option I:		
	<i>Special Topics: Innovation &amp; Entrepreneurship</i>	KU	4
	<i>Entrepreneurship in Theory and Practice</i>	VK	2
	Option II:		
	Case Studies Innovation Management	VK	2
	<i>Special Topics: Innovation &amp; Entrepreneurship</i>	KU	4
			Total: 10

**B. Operational Management & Supply Chain Management (WIWI-2)**

	Course title	Type of course	ECTS credits
3.2.2 Course selection from the WIWI field Operational Management & Supply Chain Management	<i>Supply Chain Planning</i>	VK	4
	<i>SAP in Operational Management</i>	VK	2
	<i>Exercises and Quantitative Methods in Production Management</i>	KU	4
	OR		
	<i>Exercises and Quantitative Methods in Business Logistics</i>	KU	
			Total: 10

C. Controlling and Strategic Management (WIWI-3)

	Course title	Type of course	ECTS credits
3.2.3 Course selection from the WIWI field Controlling and Strategic Management	Decision Theory	VO	4
	Risk Management	VK	2
	Corporate Planning	KU	4
	Controlling and Behaviour Management	VK	4
			Total: 10

D. Energy and Environmental Economics (WIWI-4)

	Course title	Type of course	ECTS credits
3.2.4 Course selection from the WIWI field Energy and Environmental Economics	<i>Energy Economics: Theory and Policy</i>	KU	4
	<i>Sustainable Management in Production and Logistics</i>	VK	2
	<i>Spatial Potentials of Renewable Energy Sources</i>	VK	4
			Total: 10

**APPENDIX 7: Courses in the restricted elective “3.3a Management and Law: Complements” (Example)**

	Course title	Type of course	ECTS credits
3.2.5 Course selection from other selected WIWI courses	English language courses from the catalogues WIWI-1 to WIWI-4 (see Appendix 6) not selected elsewhere	VO/VK/KU	8
	<i>Principles of International Law</i>	VO	
	<i>PFO II, Evaluation in Organizations: Performance Management</i>	VK	
	Private Law I	VO	
	Private Business Law	VO	
	alternatively to Business Law: Labour and Social Law I	VO	
	Market Research	VK	
	Leadership in Organisations	KU	



**APPENDIX 8: Course catalogue “Management and Economics: Basic Courses” (Example)**

	Course title	Type of course	ECTS credits
Basic courses in Management and Economics <sup>4</sup>	<i>Introduction to Management</i>	VO	14
	<i>Microeconomics</i>	VO	
	<i>Selected Issues in International Business</i>	VK	
	<i>Corporate Governance: Business decisions in a complex environment</i>	VK	
	<i>Macroeconomics</i>	VO	
	Entrepreneurship-oriented introduction to Business Management	VO	
	<i>Innovation Management and Corporate Entrepreneurship</i>	VO	
	Fundamentals of Finance and Accounting for young businesses	VK	
	Introduction to Production and Logistics Management	VO	
	Personnel in Organisations	VO	
	Foundations of Cost Accounting	VO	
	Marketing	VO	
	Introduction to Economics	VO	
Geosimulation and Modelling	VO		

<sup>4</sup> Students who are not able to demonstrate relevant prior knowledge of Business Management in accordance with § 5 Para. 2 must select additional courses from this catalogue worth 8 ECTS credits for the restricted elective „3.3b Management and Economics: Basic Courses“ and worth 6 ECTS credits for the elective „3.5 Soft Skills“.

## APPENDIX 9: Course catalogue “Soft Skills” (Example)

	Course title	Type of course	ECTS credits
Soft Skills	Courses from the elective study program Feminist Sciences - Gender Studies	VO/VU/SE/PS	12 (for NC and ASR)
	Courses from „3.1 Management and Economics - Fundamentals“, „3.3a Management and Law: Complements“ and „3.3b Management and Economics: Basic Courses“ <sup>5</sup>	VO/VK/VU	6 (for BE)
	<i>Scientific Writing - for students in technical science degrees and economic sciences degrees</i>	KU	
	<i>Business Writing Skills - for students in technical science degrees and economic sciences degrees</i>	KU	
	Creative Writing	KU	
	Writing your final qualification paper. Step by step.	KU	
	RLV-Technology: Man and Machine. Social Technical Design and Technology Assessment	VP	
	Elective module Sustainable Development	VS	

<sup>5</sup> For students enrolled in the branches of study NC and ASR.

**APPENDIX 10: Non-binding recommended course of studies for orientation and planning purposes**

**A. Branch of study Networks and Communications (NC), non-binding recommended course of studies**

<b>Course title</b>	<b>1st semester</b>	<b>2nd semester</b>	<b>3rd semester</b>	<b>4th semester</b>
Mobile Communications	1 VK (4 ECTS credits)			
Signal Processing for Communications	1 VK (4 ECTS credits)			
Sensor Networks		1 VK (4 ECTS credits)		
Courses from NC-Advanced catalogue	4 VK (16 ECTS credits)  2 KU (6 ECTS credits)	3 KU (9 ECTS credits)		
Courses from ICE-Supplement catalogue		1 SE (4 ECTS credits)  3 VK (12 ECTS credits)  1 KU (3 ECTS credits)		
Placement (TE-Complement)			1 PV (6 ECTS credits)	
Courses from TE-Complement catalogue			2 VO (6 ECTS credits)	
Courses from Soft Skills			2 VO (6 ECTS credits)  2 KU (6 ECTS credits)	
Free Electives			1 VK (4 ECTS credits)	
Master thesis incl. Privatissimum				30 ECTS credits
<b>Total ECTS credits</b>	<b>30</b>	<b>32</b>	<b>28</b>	<b>30</b>

B. Branch of study Autonomous Systems and Robotics (ASR), non-binding recommended course of studies

Course title	1st semester	2nd semester	3rd semester	4th semester
Robotics	1 VK (4 ECTS credits)			
Sensors and Actuators		1 VK (4 ECTS credits)		
Control of Autonomous Systems		1 VK (4 ECTS credits)		
Courses from ASR-Advanced catalogue	4 VK (16 ECTS credits)  3 KU (9 ECTS credits)	2 KU (6 ECTS credits)		
Courses from ICE-Supplement catalogue		1 SE (4 ECTS credits)  3 VK (12 ECTS credits)  1 KU (3 ECTS credits)		
Placement (TE-Complement)			1 PV (6 ECTS credits)	
Courses from TE-Complement catalogue			2 VO (6 ECTS credits)	
Courses from Soft Skills			2 VO (6 ECTS credits)  2 KU (6 ECTS credits)	
Free Electives			1 VK (4 ECTS credits)	
Master thesis incl. Privatissimum				30 ECTS credits
Total ECTS credits	29	33	28	30

C. Branch of study Business Engineering (BE), non-binding recommended course of studies

Course title	1st semester	2nd semester	3rd semester	4th semester
Value based Management	1 VK (2 ECTS credits)			
Operational Management and Logistics	1 VK (2 ECTS credits)			
Energy Economics: Theory and Policy		1 VK (4 ECTS credits)		
Courses from the catalogue „3.2 Management and Economics: Advanced“	4 VO (12 ECTS credits)	2 VK (8 ECTS credits)		
Courses from the catalogue „3.3a Management and Law: Complements“			2 VK (6 ECTS credits)  1 VO (2 ECTS)	
Courses from the catalogue „3.4b Autonomous Systems and Robotics“	3 VK (12 ECTS credits)  1 KU (3 ECTS credits)	1 SE (4 ECTS credits)  3 VK (12 ECTS credits)  1 KU (3 ECTS credits)	1 KU (3 ECTS credits)  2 VO (6 ECTS credits)	
Courses from Soft Skills			2 VO (6 ECTS credits)	
Free Electives			1 VO (2 ECTS credits)  1 VK (3 ECTS credits)	
Master thesis incl. Privatissimum				30 ECTS credits
Total ECTS credits	31	31	28	30