Curriculum of the Bachelor's Programme

Electrical Engineering and Audio Engineering

Curriculum 2007 in the 2009 Version

This curriculum was approved by the Curricular Committee of Graz University of Technology in the meeting of 20 April 2009 and by the Senate of the University of Music and Performing Arts, Graz, in the meeting of 16 June 2009.

On the basis of the University Studies and Organisation Act 2002 (UG 2002), Austrian Federal Law Gazette I No. 120/2002 in the valid version, the Senate of Graz University of Technology and the Senate of the University of Music and Performing Arts, Graz, enact the present curriculum for the Electrical Engineering and Audio Engineering bachelor's programme.

§ 1 General Provisions

The engineering sciences bachelor's programme in Electrical Engineering and Audio Engineering has been set up as an inter-university course of study at Graz University of Technology (TU Graz) and the University of Music and Performing Arts, Graz (KUG). The bachelor's degree programme comprises six semesters and is divided into two stages, and the whole programme consists of 180 ECTS credits. Graduates are awarded the degree of Bachelor of Science (BSc).

§ 1a Admission to the Course of Studies

For admission to the course of studies, an artistic aptitude test has to be taken according to § 63 para. 1 clause 4 UG 2002 at KUG (University of Music and Performing Arts, Graz). This consists of the following three parts:

1. Written hearing test 1: This tests differential thresholds for frequency, intensity and tone length by means of comparing pairs, and the ability to differentiate between tone colours as well as tone and rhythm memory.

2. Written hearing test 2: This includes a melody and rhythm dictation and the recognition of modes, tempos, triads and instruments. Furthermore, errors in a printed score of a musical example are to be detected. All examples are played several times.
3. Written music theory test: This tests knowledge of music theory, such as the formation of intervals, formation of scales including scalar triads, scale analysis, chord inversions and rhythm notation.

An accompanying mathematics placement test is offered with the artistic aptitude admission test. This tests an aspect of scientific knowledge using mathematics tasks at secondary school graduate level, such as: curve sketching, arithmetic with complex numbers, interpreting diagrams, integral and differential calculus, sequences and series, trigonometry, and solving equations.

The accompanying mathematics placement test is not part of the admission test for artistic aptitude. Instead, it serves to invite applicants who passed the admission test but who scored poorly on the mathematics placement test to a meeting to inform them about the contents and objectives of the Electrical Engineering and Audio Engineering programme before the programme starts. The entitlement to a place in the programme based on the results of the artistic admission test remains unaffected, and is independent of the result of the accompanying mathematics placement test.

§ 2 Qualification Profile

The bachelor's programme Electrical Engineering and Audio Engineering aims to provide training according to the job description of a graduate engineer in the field of electrical engineering and audio engineering. Completion of the bachelor's programme represents the first academic milestone that provides the educational requirements and basis for scientific and artistic musical knowledge and skills for entry into a variety of careers. The following description is results-oriented and specifies concrete activities and skills which a person with average talent and motivation is in the position to carry out or apply after completing the programme.

Scientific knowledge and skills

Graduates of the bachelor's programme understand the scientific basics and methods of electrical engineering and acoustics and are able to apply them. This imparts a basic, professional preparatory training enabling the graduate to find employment in the field of IT applications and services with a focus on audio engineering and signal processing as well as in acoustics.

On completion of the bachelor's programme, graduates have mastered fundamental scientific knowledge, in particular in the fields of mathematics and physics. Graduates are also able to model and evaluate complex systems with particular orientation to audio engineering or acoustic problems and applications.
The bachelor's programme enables the graduate to join a relevant master's programme or to begin other master's programmes with suitable additional skills.

Technical knowledge and skills

Graduates of the bachelor's programme are able to analyse and model technical tasks in the area of IT with a focus on audio engineering and signal processing as well as on acoustics. At the same time, skills are acquired during the course of studies to develop independent solutions using current aids and methods.

By acquiring the ability of self-regulated acquisition of knowledge, graduates of the bachelor's programme are able to adjust themselves to the changing conditions and demands in science and technology and to broaden their own fields of expertise in terms of life-long learning.

By completing one optional seminar in the context of which the bachelor's thesis is to be written, the graduate of the bachelor's programme acquires the latest knowledge and the necessary fundamental abilities in terms of a personal specialised training in one specialist area chosen from audio-signal processing, audio electronics, acoustics, recording engineering and computer music.

Musical and artistic knowledge and skills

The graduate of the bachelor's programme is able to understand and shape musical interrelations on the basis of a fundamental theoretical and practical musical education which includes instrumental practice.

Economic, social and communicative knowledge and skills

By implementing the knowledge and the experience resulting from this on a practical level, the graduate is able to effectively and properly present and represent technical interrelations and facts.

The basic musical training combined with a technical and scientific education puts the graduate in the position to work in the field of technology and music as an interdisciplinary mediator on the interface between science and art. In particular, the graduate is an expert partner to artists in questions of acoustics, recording engineering and sound reproduction and in questions of computer music.

Specialist lectures and free optional courses help graduates to orientate themselves in the area of conflict between technology and art, to understand the language and content of these specialist fields, and to bring interdisciplinary expertise with them into collaborations and problem solving. On the basis of this expertise they are able to evaluate their own actions in various social contexts.

§ 3 ECTS Credits

ECTS credits (European Credit Transfer and Accumulation System), which describe the relative share of the workload, are awarded to individual performances. The University Studies and Organisation Act has established the workload of one ECTS credit at an average of 25 hours.

§ 4 Structure of the Course of Studies

The first stage of studies (orientation year) contains courses of an introductory character and is composed of all courses of the 1st and 2nd semesters. Courses belonging to the first stage of studies are marked in the table in § 5 with a * in the first column.

The second stage of studies contains courses of an in-depth character and comprises all courses from the 3rd to the 6th semester.

The individual courses of the bachelor's programme and their allocation to the examination subjects are listed in § 5. For each course, it is decided at which university, either TUG (Graz University of Technology) or KUG (University of Music and Performing Arts, Graz) they are to be taken. The assigned semester sequence is a recommendation and ensures that the succession of courses is optimally built on previous knowledge and that the annual workload does not exceed 60 ECTS credits.

According to § 66 of the University Studies and Organisation Act 2002 (UG 2002), the introductory phase of studies comprises introductory and orientation courses which are marked with (eo).

The free subject of the bachelor's programme contains free optional courses to the amount of 7 ECTS credits.

According to § 80 of the University Studies Act (UG 2002), the bachelor's thesis is to be written in the context of one of eight "seminar" type courses which is to be chosen from the table in § 5 under "Key competencies and bachelor thesis". The bachelor thesis is an independent, written work which is not to be regarded as the conclusion of the programme.

In view of the interdisciplinarity of the course of studies with its techno-scientific and musico-artistic content, key competencies such as, for instance, philosophical and sociological questions have been integrated in a range of specialist courses mentioned in the compulsory area.

§ 5 Content of Programme and Semester Plan

Electrical Engineering and Audio Engineering									
Subject Course		Course		Semester with ECTS					
	SHs	Type	ECTS	I	II	III	IV	V	VI
Mathematic and natural scientific foundations (TU Graz)									
* Mathematics A for Electrical Engineering	4.0	VO	5.0	5.0					
* Mathematics A for Electrical Engineering	2.0	UE	3.0	3.0					
* Mathematics B for Electrical Engineering	4.0	VO	5.0		5.0				
* Mathematics B for Electrical Engineering	2.0	UE	3.0		3.0				
Mathematics C for Electrical Engineering	2.0	VO	2.5			2.5			
Mathematics C for Electrical Engineering	1.0	UE	1.5			1.5			
Probability and Stochastic Processes	2.0	VO	2.5			2.5			
Probability and Stochastic Processes	1.0	UE	1.5			1.5			
* Signal Transforms (eo)	1.0	VO	1.0		1.0				
* Signal Transforms (eo)	1.0	UE	1.5		1.5				
* Physics	3.0	VO	4.0	4.0					
* Physics	1.0	UE	1.5	1.5					
Subtotal of mathematic and natural scientific foundations	24.0		32.0	13.5	10.5	8.0	0.0	0.0	0.0
Electrical engineering foundations (TU Graz)			0.0						
* Fundamentals of Electrical Engineering (eo)	3.0	VO	4.0	4.0					
* Fundamentals of Electrical Engineering (eo)	1.0	UE	1.5	1.5					
* Introduction to Electrical Engineering, Laboratory	2.0	LU	3.0		3.0				
Electric Circuits and Multiports	3.0	VO	4.0			4.0			
Electric Circuits and Multiports	2.0	UE	2.5			2.5			
Electrodynamics 1	3.0	VO	4.0				4.0		
Electrodynamics 1	2.0	UE	2.5				2.5		
System Engineering	3.0	VO	4.0			4.0			
System Engineering	1.0	UE	1.0			1.0			
Subtotal Electrical engineering foundations	20.0		26.5	5.5	3.0	11.5	6.5	0.0	0.0
Electrical and information engineering (TU Graz)									
* Electronic Circuit Design 1 (eo)	2.0	VO	2.5		2.5				
* Electronic Circuit Design 2 (eo)	2.0	VO	2.5		2.5				
Electronic Circuit Design, Laboratory	2.0	LU	3.0				3.0		
Measurement 1	2.0	VO	2.5			2.5			
Communication Engineering	3.0	VO	3.0						3.0
Communication Engineering	2.0	UE	2.5						2.5
Signal Processing	2.0	VO	3.5				3.5		
Signal Processing	1.0	UE	1.5				1.5		
Subtotal Electrical and information engineering	16.0		21.0	0.0	5.0	2.5	8.0	0.0	5.5
Computer science (TU Graz)									
* Introduction to Programming (eo)	2.0	VU	4.0	4.0					
* Technical Informatics 1 (eo)	2.0	UE	2.5						
* Technical Informatics 1 (eo)	1.0	UE	1.5		1.5				
Technical Informatics 2	2.0	UE	2.5						
Technical Informatics 2	1.0	UE	1.5			1.5			
Subtotal of computer science	8.0		12.0	4.0	4.0	4.0	0.0	0.0	0.0

Subject Course	SHs	Type	ECTS	I	II	III	IV	V	VI
Audio engineering and acoustics									
* Musical acoustics 01 (KUG) (eo)	2.0	VO	2.5	2.5					
* Musical acoustics 02 (KUG) (eo)	2.0	VO	2.0		2.0				
Room Acoustics (TU Graz)	2.0	VO	3.0			3.0			
Room Acoustics, Laboratory (TU Graz))	2.0	LU	3.0						3.0
Electro Acoustics (TU Graz)	2.0	VO	3.0				3.0		
Electro Acoustics (TU Graz)	1.0	UE	1.5				1.5		
Acoustical Measurements 1 (TU Graz)	2.0	VO	3.0					3.0	
Psychoacoustics 01 (KUG)	2.0	VO	2.0					2.0	
Digital Audio Engineering 1 (TU Graz)	2.0	VO	3.0					3.0	
Algorithms in acoustics and computer music 01 (KUG)	2.0	VO	3.0					3.0	
Algorithms in acoustics and computer music 01 (KUG)	1.0	UE	1.5					1.5	
Subtotal Audio engineering and acoustics	20.0		27.5	2.5	2.0	3.0	4.5	12.5	3.0
Studio and recording engineering									
* Recording Studio Equipment (TU Graz) (eo)	2.0	VO	3.0	3.0					
* Recording Studio Equipment, Laboratory (TU Graz) (eo)	1.0	LU	1.0		1.0				
Measurement Techniques in Recording Systems, Laboratory (TU Graz) (eo)	2.0	LU	2.0				2.0		
Recording analysis (KUG)	2.0	VU	2.0					2.0	
Audio Cutting Technique, Laboratory (TU Graz)	2.0	LU	1.5				1.5		
Recording and postproduction 01 (KUG)	2.0	VO	3.0					3.0	
Recording and postproduction 01 (KUG)	2.0	LU	3.0						3.0
Subtotal Studio and recording engineering	13.0		15.5	3.0	1.0	0.0	3.5	5.0	3.0
Computer music (KUG)									
Sound Synthesis 01	2.0	VO	2.5				2.5		
Computer music and multimedia 01	2.0	SE	3.0					3.0	
Subtotal of computer music	4.0		5.5	0.0	0.0	0.0	2.5	3.0	0.0
Musical foundations (KUG)									
Aural training TI 01	1.0	UE	1.0			1.0			
Aural training TI 02	1.0	UE	1.0				1.0		
Aural training TI 03	1.0	UE	1.0					1.0	
Aural training TI 04	1.0	UE	1.0						1.0
Instrumentation 01	1.0	VU	1.5					1.5	
* Fundamentals in music theory TI 01	1.0	VU	1.5	1.5					
Fundamentals in music theory TI 02	1.0	VU	1.5		1.5				
Harmonic analysis 01	2.0	VO	2.5					2.5	
Instrument tuition 01 - 02 *)	2.0	KG/2	4.0			2.0	2.0		
Instrument tuition 03 - 04 *)	2.0	KE	4.0					2.0	2.0
Study of musical form and analysis of works 01	2.0	VO	2.0					2.0	
Study of musical form and analysis of works 02	2.0	VO	2.0						2.0
Subtotal of music theory foundations	17.0		23.0	1.5	1.5	3.0	3.0	9.0	5.0
Key competencies and bachelor's thesis									
* Technical Reports and Presentation (TU Graz)	1.0	LU	1.0		1.0				
One of the following courses is to be chosen in the context of which the bachelor's thesis is to be written:									
Audioelectronics, Seminar (TU Graz)									
Audio Signal Processing, Seminar (TU Graz)									
Electro Acoustics and Room Acoustics, Seminar (TU Graz)									
Speech Processing, Seminar (TU Graz)									
Computer music and multimedia 02, SE (KUG)									
Musical acoustics 01, SE (KUG)									
Recording and postproduction 01, SE (KUG)									
Musicinformatics 01, SE (KUG)									
Bachelor's thesis seminar	3.0	SE	9.0						9.0
Subtotal Key competencies and bachelor's thesis	4.0		10.0	0.0	1.0	0.0	0.0	0.0	9.0

Subject	Course	SHs	Type	ECTS	I	II	III	IV	V	VI
Total compulsory subjects		**126.0**		**173.0**	**30.0**	**28.0**	**32.0**	**28.0**	**29.5**	**25.5**
Free subject										
	Free optional courses acc. to § 5a	7.0		7.0		2.0				5.0
Total amount		**133.0**		**180.0**	**30.0**	**30.0**	**32.0**	**28.0**	**29.5**	**30.5**

*) Students without a sufficient previous education in an instrument have to complete the course Piano practice TI 01 - 04 in the framework of instrument tuition 01 - 04. Students with a sufficient previous education in an instrument (after passing the placement test) can study their respective instrument instead of having to complete Piano practice TI 01 - 04.

§ 5a Free subject

The courses to be taken in the framework of the free subject in the Electrical Engineering and Audio Engineering bachelor's programme serve as individual points of focus and for students' further development and can be chosen without restriction from the range of courses offered by all recognised domestic and foreign universities. Free optional courses are not allocated to a particular stage of studies, however, it is recommended that students attend them throughout the entire course of studies.

Each semester hour (SH) of a free optional course is allocated on average 1 ECTS credit.

§ 6 Conditions of Admission to Examinations

Examinations of courses which are assigned to the 5th and 6th semesters (see § 5) can only be taken after completing the first stage of studies successfully. Accordingly, continuous-assessment courses of the 5th and 6th semesters can only be attended after the first stage of studies has been completed.

In general, the consecutive character of the courses in the curriculum is shown by the semester they are allocated to. For this reason, it is generally recommended to complete the courses and take the relevant examinations according to this sequence.

In any case, registration for the examination – or in the case of continuous assessment courses, registration for the course – in the courses in the left-hand column of the following table can only be authorised after the courses in the right-hand column have been successfully completed.

Course	**Prerequisites**
Aural training TI 01 (UE)	Mathematics A for Electrical Engineers (VO+UE) Fundamentals of Electrical Engineering (VO+UE) Physics (VO+UE) Introduction to Programming (VU) Recording Studio Equipment (VO+LU) Musical acoustics 01+02 (VO)
Instrument tuition 01 (KG/2)	Mathematics A for Electrical Engineers (VO+UE) Fundamentals of Electrical Engineering (VO+UE) Physics (VO+UE) Introduction to Programming (VU) Recording Studio Equipment (VO+LU) Musical acoustics 01+02 (VO)
Electrodynamics 1 (VO)	Mathematics A for Electrical Engineers (VO+UE) Fundamentals of Electrical Engineering (VO+UE)
Systems Engineering (VO)	Mathematics A for Electrical Engineers (VO)
Measurement 1 (VO)	Fundamentals of Electrical Engineering (VO+UE)
Signal Processing (VO)	Mathematics A for Electrical Engineers (VO+UE) Signal Transforms (VO+UE)
Room Acoustics (VO)	Mathematics B for Electrical Engineers (VO) Musical acoustics 01 (VO)
Room Acoustics (LU)	Room Acoustics (VO) Acoustical Measurements 1 (VO)
Electro Acoustics (VO)	Fundamentals of Electrical Engineering (VO+UE) Electronic circuit design1 (VO)
Recording Studio Equipment (LU)	Recording Studio Equipment (VO)
Measurement Techniques in Recording Systems (LU)	Recording Studio Equipment (LU)
Recording analysis (VU)	Room Acoustics (VO), Audio Cutting Technique (LU) Aural training TI 02 (UE) Instrument tuition 02 (KG)
Recording and postproduction 01 (KUG)	Room Acoustics (VO), Electro Acoustics (VO) Audio Cutting Technique (LU) Aural training TI 02 (UE) Instrument tuition 02 (KG)

Concerning courses with continuous assessment which make up part of the conditions for admission to the examinations, handing in later, supplementing or repeating course components must be allowed until two weeks after the commencement of the semester following the course at the latest, in order to provide speedy study progress.
If the registration period of the sequel course ends within this period, an opportunity for the above must be provided until the end of the registration deadline.

§ 7 Examination Regulations

Courses are assessed individually. The bachelor's thesis is carried out and assessed in the framework of the seminar to be chosen from the table in § 5 under "Key competencies and bachelor's thesis".

1. Examinations of courses held in the form of lectures (VO) are to assess the whole content of the course.
2. Regarding courses held in the form of lectures with integrated practicals (VU), practicals (UE), design practicals (KU), laboratory practicals (LU), projects (PR), seminars (SE), seminar projects (SP), excursions (EX) or as artistic courses (KE, KG), there is a continuous assessment based on contributions made by students and/or accompanying tests. In any case, for all courses of this type offered at Graz University of Technology, assessment has to be based on at least two examination sittings.
3. Passed examinations are to be graded as "excellent" (1), "good" (2), "satisfactory" (3) or "pass" (4); failed examinations are to be graded as "fail" (5). Expressly declared courses and courses of the type excursion are assessed with "participated with success" or "participated without success".
4. If a subject consists of several examination results corresponding to courses, a module grade is to be awarded, such that
   a) the grade of each examination result pertaining to the subject is multiplied by the ECTS credits of the relevant course,
   b) the values calculated according to a) are added,
   c) the result of the addition is divided by the sum of the ECTS credits of the courses and
   d) the result of the division is rounded to a whole-number grade if necessary. In the case of the values after the decimal point, those greater than 0.5 are to be rounded up, otherwise they are to be rounded down.

The different types of courses are laid down in part 3 of the appendix.

Additional to the types of course, the following maximum group sizes are stipulated:

1. For practicals (UE), practical shares of lectures with integrated practicals (VU) and for design practicals (KU), the maximum group size is 30.
2. For projects (PR), seminars (SE) and excursions (EX), the maximum group size is 15.
3. For laboratory practicals (LU), the maximum group size is 6.
4. For artistic group tuition (KG) in the courses Instrument teaching 1+2, the maximum group size is 2.

The allocation of places in individual courses takes place according to the guidelines in part 3 of the appendix.

§ 7a Completion of the First Stage of Studies

Successful completion of the first stage of studies is certified when all the examinations of the first stage of studies have been passed.

§ 7b Certificate of Graduation

The certificate of graduation from the bachelor's programme contains

a) All the examination subjects according to § 5 and their grades,
b) The total amount in ECTS credits of the passed free optional courses according to § 5a,
c) The overall grade according to § 73 para. 3, UG 2002.

§ 8 Transitional Regulations

Regular students who started their studies in Electrical Engineering and Audio Engineering before 1.10.2007 are entitled to continue and complete their studies by 31.1.2014 according to the previous valid curriculum made public in bulletin No. 20a of TU Graz dated 30.6.2005 and in bulletin No. 21 of the version published by KUG dated 6.7.2005. If the studies are not completed within this period, students will be subject to the present curriculum for the remaining time of the course of studies. As for the rest, students are entitled to choose to be subject to the present curriculum at any time on a voluntary basis within the enrolment period. An irrevocable declaration in writing regarding the same is to be made at the Registration Office by students who were enrolled at Graz University of Technology. Students who were enrolled at the University of Music and Performing Arts, Graz, are to make the declaration to the Admissions Office of the University of Music and Performing Arts Graz.

Regular students who started their studies in Electrical Engineering and Audio Engineering after 1.10.2007 are subject to the present curriculum. If students have completed the first stage of studies by 30.9.2009, this will be deemed as completed also under the new version of the curriculum. For completion of the bachelor programme, however, all compulsory courses of the present curriculum must be demonstrated to have been successfully completed, independently of which stages of study they were originally allocated to.

§ 9 Entering into Effect

This curriculum entered into effect on 1st October 2009.

Appendix to the Curriculum of the Electrical Engineering and Audio Engineering Bachelor's Programme

Part 1 of Appendix:

Equivalence and Recognition Lists

An equivalence list defines the equivalence of passed courses of the old (diploma studies) and the new curriculum (bachelor programme). This equivalence list is valid in both directions. I.e. passed courses in the old curriculum can be accredited in the new curriculum and passed courses in the new curriculum can be accredited in the old curriculum.

Courses whose title, type, number of ECTS credits and number of semester hours are in agreement, are regarded as equivalent and are therefore not explicitly stated in the equivalence list.

For courses whose equivalence or recognition is defined in this part of the appendix, no separate recognition by the Dean of Studies responsible is required any more. Furthermore, it is of course still possible for a course to be individually recognised according to § 78 UG 2002 on the basis of an official notification by the Dean of Studies responsible.

Equivalence List 1: Diploma Studies – Bachelor's Programme (bilaterally valid)

Diploma studies				**Bachelor's programme**			
	SHs		**ECTS**	**Foundations of mathematics and natural sciences**	**SHs**		**ECTS**
Physics for Electrical Engineers	3	VO	4.5	Physics	3	VO	4
				Electrical engineering foundations			
Theory of Electrical Engineering 1	3	VO	4.5	Electrodynamics 1	3	VO	4
Theory of Electrical Engineering 1, English	3	VO	4.5	Electrodynamics 1	3	VO	4
Fundamentals of Electrical Circuits	2	UE	2	Electric Circuits and Multiports	2	UE	2.5
Systems Engineering	3	VO	4.5	Systems Engineering	3	VO	4
Systems Engineering	1	UE	1.5	Systems Engineering	1	UE	1
				Electrical and information engineering			
Electronic Circuit Design 1	2	VO	3	Electronic Circuit Design 1	2	VO	2.5
Electronic Circuit Design, Laboratory	2	LU	2.5	Electronic Circuit Design, Laboratory	2	LU	3
Electrical Measurement 1	2	VO	3	Measurement 1	2	VO	2.5
Communications Engineering	3	VO	4.5	Communications Engineering	3	VO	3.0
Communications Engineering	2	UE	3	Communications Engineering	2	UE	2.5
Signal Processing	2	VO	3	Signal Processing	2	VO	3.5

				Computer science			
Introduction to Computer Science	1	VO	3	Introduction to Programming	2	VU	4
Introduction to Computer Science, Laboratory	2	LU	1.5				
Technical Informatics 1	1	RU	1.5	Technical Informatics 1	1	UE	1.5
Technical Informatics 2	2	VO	3	Technical Informatics 2	2	VO	2.5
Technical Informatics 2	1	RU	1.5	Technical Informatics 2	1	UE	1.5
				Audio engineering and acoustics			
Psychoacoustics 01	2	VO	3	Psychoacoustics 01	2	VO	2
Acoustical Measurements	2	VO	3	Acoustical Measurements 1	2	VO	3.0
Room Acoustics	2	LU	2	Room Acoustics, Laboratory	2	LU	3.0
				Studio and recording engineering			
Recording Studio Equipment	2	VO	2	Recording Studio Equipment	2	VO	3
Measurement Techniques in Recording Systems	2	LU	1	Measurement Techniques in Recording Systems, Laboratory	2	LU	2.0
Audio cutting technique	2	LU	2.5	Audio cutting technique, laboratory	2	LU	1.5
Recording analysis and music theory tutorial	1+1	SE+ VO	1+1	Recording analysis	2	VU	2
				Computer music			
Introduction to electronic music 02	2	VO	3	Sound Synthesis 01	2	VO	2.5
Computer music 01	2	SE	3	Computer music and multimedia 01	2	SE	3
				Musical foundations			
Study of musical form and analysis of works 01	2	VO	3	Study of musical form and analysis of works 01	2	VO	2
Study of musical form and analysis of works 02	2	VO	3	Study of musical form and analysis of works 02	2	VO	2
Harmonic analysis 01	2	VO	3	Harmonic analysis 01	2	VO	2.5

Equivalence List 2: Bachelor's Programme (1. 10. 2007) – Bachelor's Programme (1. 10. 2009)

Bachelor's programme (1.10.2007)				Bachelor's programme (1.10.2009)			
	SHs		**ECTS**	**Electrical and information engineering**	**SHs**		**ECTS**
Communications Engineering	3	VO	2.5	Communications Engineering	3	VO	3
Introduction to Computer Ccience	1	VO	3.0	Introduction to Programming	2	VU	4
Introduction to Computer Science, Laboratory	2	LU	1.5				
Signal Processing	1	UE	2	Signal Processing	1	UE	1.5
				Audio engineering and acoustics			
Room Acoustics, Laboratory	2	LU	2.5	Room Acoustics, Laboratory	2	LU	3
Acoustical Measurements 1	2	VO	2.5	Acoustical Measurements 1	2	VO	3
				Studio and recording engineering			
Recording Studio Equipment	2	VO	2	Recording Studio Equipment	2	VO	3
Recording Studio Equipment, Laboratory	1	LU	0.5	Recording Studio Equipment, Laboratory	1	LU	1
Measurement Techniques in Recording Systems, laboratory	2	LU	1.5	Measurement Techniques in Recording Systems, laboratory	2	LU	2

				Musical foundations (KUG)			
Fundamentals in music theory TI 01	2	VO	1.5	Fundamentals in music theory TI 01	2	VU	1.5
Fundamentals in music theory TI 02	2	VO	1.5	Fundamentals in music theory TI 02	2	VU	1.5
				Key competencies and bachelor's thesis			
Bachelor's thesis 1 seminar and Bachelor's thesis 2 seminar	2 2	SE SE	6 6	Bachelor's thesis seminar and free optional courses	3 3	SE	9 3

A recognition list, in contrast, defines in which cases passed courses of the old curriculum (diploma studies) can be definitively recognised as passed courses of the new curriculum (bachelor's programme). In this case, however, there is no automatic accreditation in the other direction.

Recognition List 1: From Diploma Studies to Bachelor's Programme

Diploma studies				**Bachelor's programme**				***)**
	SHs		**ECTS**	**Foundations of mathematics and natural sciences**	**SHs**		**ECTS**	**SHs**
Mathematics 1 for Electrical Engineers	6	VO	9	Mathematics A for Electrical Engineers	4		5	1
Mathematics 1 for Electrical Engineers	2	UE	3	Mathematics A for Electrical Engineers	2	UE	3	
				Mathematics C for Electrical Engineers	2	VO	3	
				Mathematics C for Electrical Engineers	1	UE	1.5	
Mathematics 2 for Electrical Engineers	6	VO	9	Mathematics B for Electrical Engineers	4	VO	5	1
Mathematics 2 for Electrical Engineers	2	UE	3	Mathematics B for Electrical Engineers	2	UE	3	
				Probability and Stochastic Processes	2	VO	2.5	
				Probability and Stochastic Processes	1	UE	1.5	
Physics for Electrical Engineers	3	VO	4.5	Physics	1	UE	1.5	1
				Electrical engineering foundations				
Fundamentals of Electrical Engineering	2	VO	3	Fundamentals of Electrical Engineering	3	VO	4	1
Fundamentals of Electrical Circuits	2	VO	2	Electric Circuits and Multiports	3	VO	4	1
Theory of Electrical Engineering 1	1	UE	1.5	Electrodynamics 1	2	UE	2.5	1
Introduction to Electrical Measurement, Laboratory	1	LU	1.5	Introduction to Electrical Engineering, Laboratory	2	LU	3	
Electrical Measurement 2	2	VO	3	Technical Reports and Presentation	1	LU	1	
				Electrical and information engineering				
Electronic Circuit Design 2	4	VO	6	Electronic Circuit Design 2	2	VO	2.5	-1
				Fundamentals of Electrical Engineering	1	UE	1.5	
				Computer science				
Technical Informatics 1	3	VO	4.5	Technical Informatics 1	2	VO	2.5	-1
				Studio and recording engineering				
Recording and postproduction 01	3	SE	4.5	Recording and postproduction 01	2	VO	3	-1
Recording and postproduction 01	3	LU	3.5	Recording and postproduction 01	2	LU	3	-1
Subtotal:								2
No longer available in the bachelor's programme								
Linear Algebra and Numerical Methods	2	VO	3	Accreditable as a free optional course				
Linear Algebra and Numerical Methods	1	UE	1	Accreditable as a free optional course				
Dynamic Systems	3	VO	4.5	Accreditable as a free optional course				

*) Positive balance = changeover gain; negative balance = changeover loss
If the individual balance is negative when changing over (surplus of semester hours when changing over from diploma studies to bachelor's programme), these surplus semester hours will be accredited as free optional courses.

Recognition List 2: From Bachelor's Programme to Diploma Studies

Bachelor's programme				Diploma studies				*)
Foundations of mathematics and natural sciences	**SHs**		**ECTS**		**SHs**		**ECTS**	**SHs**
Mathematics A for Electrical Engineers	4		5	Mathematics 1 for Electrical Engineers	6		9	-1
Mathematics A for electrical Engineers	2	UE	3	Mathematics 1 for Electrical Engineers	2	UE	3	
Mathematics C for Electrical Engineers	2	VO	3					
Mathematics C for Electrical Engineers	1	UE	1.5					
Mathematics B for Electrical Engineers	4	VO	5	Mathematics 2 for Electrical Engineers	6		9	-1
Mathematics B for Electrical Engineers	2	UE	3	Mathematics 2 for Electrical Engineers	2	UE	3	
Probability and Stochastic Processes	2	VO	2.5					
Probability and Stochastic Processes	1	UE	1.5					
Electrical engineering foundations								
Fundamentals of Electrical Engineering	3	VO	4	Fundamentals of Electrical Engineering	2	VO	3	-1
Electrical Circuits and Multiports	3	VO	4	Fundamentals of Electrical Circuits	2	VO	2	-1
Introduction to Electrical Engineering, Laboratory	2	LU	3	Introduction in measuring technique	1	LU	1.5	-1
Electrodynamics 1	2	UE	2.5	Theory of Electrical Engineering 1	1	UE	1.5	-1
Electrical and information engineering								
Electronic Circuit Design 2	2	VO	2.5	Electronic Circuit Design 2	4	VO	6	2
Computer science								
Technical Informatics 1	2	VO	2.5	Technical Informatics 1	3	VO	4.5	1
Studio and recording engineering								
Recording analysis	2	VU	2	Recording analysis	1	SE	1	-1
Recording and postproduction 01	2	VO	3	Recording and postproduction 01	3	SE	4.5	1
Recording and postproduction 01	2	LU	3	Recording and postproduction 01	3	LU	3.5	1

*) Positive balance = changeover gain; negative balance = changeover loss.

Part 2 of Appendix:

Recommended free optional courses

Free optional courses can be chosen without restriction from the range of courses of all recognised domestic and foreign universities according to § 5a of this curriculum.
For the orientation year, free optional courses are recommended which balance out the deficits in knowledge and ability caused by differences in the degree of previous knowledge.
To promote a broadening of the knowledge base in the subjects of this course of studies, other techno-scientific and musico-artistic subjects are recommended from the areas of foreign languages, key competencies, technological impact assessment and women's and gender studies. Special reference is here made to services provided by the Languages, Key Competencies and In-House Training service unit at TU Graz, the Centre for Social Competence at University of Graz and the Inter-University Research Centre for Technology, Work and Culture (IFZ) .

Part 3 of Appendix:

Courses

(according to the guideline regarding types of courses issued by the Curricular Committee of the Senate of Graz University of Technology dated 6.10.2008 and the guideline regarding types of courses issued by the Curricular Committee of the University of Music and Performing Arts, Graz, dated 17.1.2005).

1. Lecture-type courses: VO
   In lecture-type courses, the different parts of the subject and its methods are introduced in a well prepared, didactic way. Assessment is by examinations, either written, oral or written and oral according to the choice of the examiner. The examination mode must be defined in the course description.

   a) VO
      In lectures (VO), the content and methods of a subject are presented.

2. Courses of the type: UE, KU, LU, PR
   In practicals, abilities and skills are imparted in the framework of the scientific pre-professional education to expand and deepen the material taught in the respective lectures using practical, experimental, theoretical and/or design work. Practicals are continuous-assessment courses. The maximum size of groups is set by the curriculum or by the dean of studies of TU Graz for courses of Graz University of Technology and by the vice rector for academics of KUG for courses of the University of Music and Performing Arts, Graz. Special consideration must be given to the available space and required apparatus.

   a) UE
      In practicals, student's abilities are developed by applying the subject matter to concrete problems.

   b) KU
      In design practicals, abilities and skills in the framework of previous scientific education are imparted for the expanding and in-depth analysis of material taught in the respective lectures in terms of design. Special apparatus and/or a specially equipped room is required.

   c) LU
      In laboratory practicals, skills and abilities are imparted in the framework of the scientific pre-professional education to expand and deepen the material taught in the respective lectures in practical, experimental and/or design work under especially intensive supervision. A special component of laboratory practicals includes preparing results of the work carried out.

   d) PR
      In projects, experimental, theoretical and/ or design-applied work, and/ or small research work is carried out, taking into account all the necessary working steps. Projects are completed with a written work, which forms part of the assessment. Projects can be carried out in the form of teamwork or

individual work; in the case of teamwork, the individual performances must be able to be assessed.

3. Lecture with integrated practical-type courses: VU
   In courses of the type lecture with integrated practical, the different parts of the subject and its methods are introduced in a well prepared, didactic way, and at the same time co-ordinated closely with the lecture part, and abilities and skills in the framework of scientific preprofessional education are imparted by deepening and/or expanding the material in practical, experimental, theoretical and/or design work.
   Such courses are continuous assessment courses. The maximum group size is laid down in the curriculum or by the Dean of Studies, respectively. Special consideration must be given to the available space and required apparatus.

   a) VU
      Lectures with integrated practicals, in addition to introducing the different parts of a subject and its methods, also offer guidance on independent acquisition of knowledge or independent application using examples. The share of lectures and practicals is to be stipulated in the curriculum.

4. Seminar-type courses: SE, SP
   Seminar-type courses are for scientific and scientific/artistic work and discussion and are intended to introduce discourse and argumentation. Students are required to carry out written work and/or an oral presentation and participation in a critical discussion. Seminars are continuous-assessment courses.

   a) SE
      Seminars serve to introduce scientific methods, to elaborate and critically evaluate results of the student's own work and special areas of scientific literature, and to exercise specialised language.

   b) SP
      In seminar projects, scientific methods are used to develop experimental, theoretical and/ or design-applied problems and/ or small-scale research is carried out taking into account all the necessary working steps. Seminar projects are completed with a written work and an oral presentation, which form part of the assessment. Seminar projects can be carried out in the form of teamwork or individual work; in the case of teamwork, the individual performances must be able to be assessed.

5. Excursion-type courses: EX
   Excursion-type courses serve to illustrate and consolidate teaching content. Courses of this type are graded with “participated with success” or “participated without success”.

   a) EX
      Excursions serve to illustrate content elaborated in other course types through a practical component outside the studies location.

6. Artistic courses: KE, KG

   a) KE
      The artistic private tutorial (KE) serves to promote the unfolding of students’ individual artistic talents and the acquisition of artistic, technical skills.
      Course leaders are free to use a lesser amount of the course as group tuition if the teaching content and/ or applied methodology require it.

   b) KG
      The artistic group tuition (KG) serves to promote the unfolding of students’ individual artistic talents and the acquisition of artistic, technical skills.

Allocation of places in the case of courses with limited numbers of participants:

If more students register for a course than is appropriate for one group, additional groups or parallel courses are to be scheduled.

If, in exceptional cases, the relevant highest number of participants in optional courses is exceeded due to a lack of resources, care must be taken to give the registered students the opportunity to take the course at the earliest possible time.