Examination Regulations (Rules) of the Faculty of Engineering at Christian-Albrechts-Universität zu Kiel (Kiel University) for students of Electrical and Information Engineering leading to a Master of Science degree (M.Sc.) - 2022

of 15 July 2021

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[Non-official publication]

Based on § 52 (1) 1 of the Schleswig-Holstein Higher Education Act (HSG) in the version published on 5 February 2016 (GVOBl. Schl.-H. p. 39), last amended by the law of 13 December 2020 (GVOBI. Schl.-H., p. 2), after a resolution was passed by the Convention of the Faculty of Engineering of 14 April 2021, the following Rules were issued:

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§ 1
Scope of application

(1) These degree-specific examination regulations in conjunction with the Examination Procedure Regulations of Kiel University for students of Bachelor's and Master's Degree Programmes (Prüfungsverfahrensordnung, PVO) apply to the teaching and assessment of the Master's degree programme "Electrical and Information Engineering" at Kiel University.

(2) Admission to modules offered by other faculties or other institutes of the same faculty and the respective examinations are subject to the examination regulations of the respective faculties or institutes.

§ 2
Objective of the degree programme

(1) The degree programme in Electrical and Information Engineering leading to a Master of Science (M.Sc.) builds on the Bachelor's degree programme in Electrical Engineering and Information Technology at Kiel University and provides students with advanced knowledge, skills and scientific methods relating to the subject. In doing so, students have the opportunity to specialise individually.

(2) Graduates are able to analyse a specific task within their subject and to work on in independently and in a team by applying scientific methods and solve it efficiently. Accordingly, graduates are particularly well-suited for challenging roles in professional practice or as early career researchers.

(3) The specific profile of the consecutive English-language degree programme is characterised by the objective of enabling graduates to consistently meet the challenges of professional practice in a German and international environment.

§ 3
Academic year

The academic year applies; registrations are possible for summer and winter semesters.

§ 4
Admission to degree programmes

(1) Graduates from the seven-semester Bachelor's degree programme in Electrical Engineering and Information Technology at Kiel University are admitted to the Master's degree programme without any further technical requirements.

(2) Graduates from other degree programmes and other institutions of higher education are admitted if the university degree of the graduate in question shows no substantial differences to the Bachelor's degree in Electrical Engineering and Information Technology from Kiel University in terms of scope and content. Furthermore, sufficient English language skills must be demonstrated by a score of at least 145 points on the Verbal Reasoning section of a GRE®revised General Test.

(3) An form-bound application for assessing eligibility requirements must be made within the deadlines specified on the Institute of Electrical Engineering and Information Technology's website to determine whether there are substantial differences in the sense of paragraph 2. The corresponding application period is set by the Examination Board. The application is to be submitted together with:

1. the Bachelor's degree certificate, or – if the degree certificate is not yet available – an official transcript of records. The respective document must contain the title of the successfully completed modules and the grades achieved and shall include information on the scope of the individual modules, e.g. in the form of ECTS credits.

2. the Module Handbook for the Bachelor's degree or a comparable document showing the scope in terms of time, teaching forms, contents and learning objectives of the individual modules, as well as

§ 5
Teaching and examination language

Lectures and examinations will be offered in English. More details can be found in the study qualification rules (Studienqualifikationssatzung).
In particularly justified exceptional cases, modules which were not taught or examined in English may also be recognised for the degree programme with the approval of the Chairperson of the Examination Board.

§ 6
Structure and scope of curriculum, standard period of study

(1) The total module requirement for successful completion of the degree programme amounts to a maximum of 48 contact hours per week (Semesterwochenstunden - SWS) and 60 ECTS credits, plus 30 ECTS credits for the Master's thesis.

(2) The standard period of study including the Master's thesis is three semesters.

(3) The Master's examination is comprised of the individual module examinations and the Master's thesis.

(4) Within the scope of their degree programme, students select modules totalling 60 ECTS credits from the 'core modules', 'in-depth modules', 'seminars' and 'laboratory courses and projects'.

(5) Details of all modules are provided in the module handbook. The Chairperson of the Examination Board oversees updating of the module handbook. The module handbook is published on the websites of the Department of Electrical and Information Engineering.

§ 7
Degree programme schedule

(1) In accordance with the Annex 1, the degree programme comprises modules from four different sections as follows:
   1. 45 ECTS credits are to be acquired from the 'core modules' and 'in-depth modules' together, of which at least 15 ECTS credits must stem from 'core modules' (module group 5000) and at least 15 ECTS credits from 'in-depth modules' (module group 6000).
   2. 15 ECTS credits are to be acquired from 'seminars' and 'laboratory courses and projects' together, of which at least 5 ECTS credits must stem from 'seminars' (module group 7000) and at least 5 ECTS credits from 'laboratory courses and projects' (module group 8000).

(2) In accordance with the provisions of (1), students shall put together their chosen curriculum at the start of their degree. They may select a curriculum with or without a designated specialisation. In the case of specialisation, the chosen compulsory elective modules must be compiled in such a way to ensure that the resulting curricula automatically fulfil the requirements of (1). Students who opt for a study plan with a specialisation shall register this with the Examination Office for Electrical Engineering and Information Technology within the first two months of their studies. Upon application to the Examinations Office for Electrical Engineering and Information Technology, students can change their choice during the course of their studies. A change is no longer possible once the certificate and the associated documents have been issued.

(3) A curriculum may contain modules offered by other institutes and faculties. In this case, the following rules apply:

1. Modules offered by other institutes and faculties that are included in the module overview of the Master's degree programme in Electrical and Information Engineering may be taken without a separate application. They are assigned to one of the existing sections of "core modules", "specialization modules", "seminars" or "practicals and projects" in accordance with the module overview.
2. Modules offered by other institutes and faculties that are not included in the module overview of the Master's degree programme in Electrical and Information Engineering may only be taken with the approval of the Chairperson of the Examination Board and only with the agreement of the establishment offering the modules. A recommendation of appropriate modules can be found in the module handbook. The application is to be submitted to the Examination Office for Electrical Engineering and Information Technology. The curriculum is to be attached to the application. As a prerequisite for approval, students must be able to take the corresponding modules within the framework of capacities of and subject to the agreement of the establishment offering the modules. After consultation with the respective module coordinator or subject administrator, the Chairperson of the Examination Board will determine whether the module equates sufficiently to the Master's degree programme in Electrical and Information Engineering and to which module group the module should be allocated.

§ 8
Examinations

(1) The following types of examination are permitted in the modules offered by the Institute of Electrical Engineering and Information Technology, and the Master's thesis, for the sections "core modules", "in-depth modules", "seminars", "laboratory courses and projects":

1. Written examination (duration: maximum 180 minutes)
2. Oral examination (duration: 30 to 45 minutes per candidate)
3. Colloquium
4. Experiment
5. Practical task
6. Demonstration
7. Paper
8. Protocol
9. Work report
10. Written report
11. Term paper
12. Test
13. Online test
14. Presentation

Individual details about the examinations to be completed for each module can be found in the module overview. If several of the types of examination listed above are given as an option, the valid type for one academic year will be announced on the notice board at the start of the module.

(2) With the exception of written examinations, in accordance with (1), every examination can be taken as a group examination instead of an individual examination if the contributions from each candidate are clearly definable, can clearly be differentiated between and assessed, based on objective criteria. There will be an announcement at the start of the module if examinations are to be in the form of group examinations.

(3) Examinations from the Master module groups 5000 and 6000 and the Master's thesis will be graded. Examinations in the Master module groups 7000 and 8000 will not be graded. Examination performances to prove requirements are partly graded, partly ungraded.

§ 9
Requirements for admission to an examination

(1) If a module contains laboratory courses or practical exercises, admission to the examination assumes regular attendance at these courses.

(2) If a module includes courses that are not mentioned in (1), admission to the examination assumes regular attendance at these courses, if the individual students cannot achieve the qualification objective without regular attendance, if attendance is necessary in order to grasp the basic subject-specific methods, or if acquiring competence is dependent on the presence of the other participants, or on being present at a certain place. This is the case for seminars and projects within the scope of this degree programme. The obligation for regular attendance at a seminar within the scope of this degree programme is based on the premise that, in addition to oral presentations given by students, the course also provides the opportunity for all seminar attendees to learn scientific discussion. As such, in addition to the acquisition of specialist knowledge, the learning objectives of a seminar specifically encompass the development of analytical and rhetorical skills, the use of presentation techniques and the ability to successfully work in teams. An essential learning objective within a project is the ability to successfully work in teams. These respective learning objectives can only be achieved through regular attendance.

(3) Course attendance is deemed regular if

1. all experiments relating to a laboratory course and practical exercise have been carried out. If a student misses a session for reasons in § 54 (4) HSG, the lecturer can give him or her a substitute date.
2. in the case of a project or a seminar, no more than 20% of the course dates have been missed without giving reasons for the non-attendance. Section 52 (4) HSG remains without prejudice; in justified exceptional cases, the module coordinator may specify an equivalent substitute for the course elements that have been missed.

(4) Courses for which admission to the examination assumes regular attendance are marked in Annex 1.

(5) Any additional requirements for admission to examinations will be stated in Annex 2.

§ 10
Master’s thesis

(1) The application for admission to the Master's thesis is to be submitted in writing to the Examination Office.

(2) The Master’s thesis can be written in English or German. Amendments or supplements in other languages are not permitted. A Master’s thesis written in German must include a summary written in English.

(3) Students who have demonstrably acquired a minimum of 45 ECTS credits in the Master's degree programme and meet the conditions required within the scope of degree programme admission will be admitted to the Master's thesis. Only those modules or credit points can be taken into account which, in accordance with § 7 (1) required for the degree in the different sections – "core modules" and "advanced modules" as well as "seminars" and "practicals and projects".

(4) In justified exceptional cases, the Chairperson of the Examination Board may admit a candidate to the Master's thesis if he or she can demonstrate Master`s modules worth fewer than the 45 ECTS credit points stated in (3). Any possible conditions issued within

the framework of admission to the degree programme must be satisfied prior to admission to the Master's thesis.

(5) The Master's thesis may also be issued in the form of a group thesis, provided that all candidates in the group fulfil the requirements stated in (3) above and that the contributions from each individual candidate are clearly definable, can clearly be differentiated between and assessed, based on objective criteria.

(6) When applying for admission to the Master's thesis, the examination candidate may propose first and second examiners and a topic for the thesis, without this giving rise to any claim for the proposal to be considered.

(7) The thesis will be issued and supervised by a university or private lecturer working in the specialist field of Electrical Engineering and Information Technology at Kiel University.

(8) If the thesis is to be prepared at a different institute at the Faculty of Engineering, at an institution outside of the Faculty of Engineering or outside the university, it requires approval by the Chairperson of the Examination Board.

(9) The maximum period from when the topic is issued until the Master's thesis is submitted is six months.

(10) The topic of the Master's thesis may be handed back only once and only within the first month of the preparation period.

(11) The Master's thesis is to be submitted to the responsible Examination Office, on time, in the form of two hard copies and additionally one copy saved in a medium suitable for electronic data processing. The Examination Office will record the date of submission.

(12) The Master's thesis must be assessed by the first examiner and the second examiner within six weeks of submission. The thesis supervisor is the first examiner, in accordance with Paragraph 7.

§ 11
Overall grade for the Master's examination

(1) For curricula without a designated specialisation, the overall grade will be calculated from the arithmetic mean of the 'core and in-depth modules' weighted at 45 and the grade for the Master's thesis weighted at 22.5. Accordingly, the weighting of 45 corresponds to the total ECTS credits acquired in the first two semesters for graded modules – thus, an average of 22.5 ECTS credits per semester. To give achievements in the third semester a corresponding weighting in respect of the overall grade, the grade for the Master's thesis is also weighted at 22.5.

(2) The section grade for the 'core and in-depth modules' is calculated from the arithmetic mean of the core module grades and the in-depth module grades, with each section grade weighted with the ECTS credits obtained in that section.

(3) The section grade from the 'core modules' and the section grade from the 'in-depth modules' is calculated from the arithmetic mean of the core or in-depth module grades in this section, weighted according to their ECTS credits.

(4) For curricula with a designated specialisation, the overall grade will be calculated from the arithmetic mean of the 'specialisation modules and additional core and in-depth modules' weighted at 45 and the grade for the Master's thesis weighted at 22.5. Accordingly, the weighting of 45 corresponds to the total ECTS credits acquired in the first two semesters for graded modules – thus, an average of 22.5 ECTS credits per semester. To give achievements in the third semester a corresponding weighting in respect of the overall grade, the grade for the Master's thesis is also weighted at 22.5.

(5) The section grade for the 'specialisation modules and additional core and in-depth modules' is calculated from the arithmetic mean of the section grades for 'core modules in the specialisation subject', 'in-depth modules in the specialisation subject' and 'additional core and in-depth modules', with each section grade weighted with the ECTS credits obtained in that section.

(6) The section grades for 'core modules for specialisation in ...', 'in-depth modules for specialisation in ...' and 'additional core and in-depth modules' are respectively calculated from the arithmetic mean of the module grades in the corresponding section, weighted according to their ECTS credits.

(7) Students may sit more than the required number of examinations in the 'core modules' and 'in-depth modules' or 'core modules in the specialisation subject', 'in-depth modules in the specialisation subject' and 'additional core and in-depth modules' and ultimately choose which grades are recorded for the section grade. If the Master's examination is passed during an examination period, additional examinations may still be taken until the end of the corresponding examination period. Students wishing to acquire more than the required ECTS credits must notify the Examination Office of this in good time. Notification will be considered to be in good time if done within five working days of the date the student knows or is in a position to know that they have acquired, by way of successful examination, the necessary number of ECTS credits for the Master's examination.

Where notification is not forthcoming or is not in good time, the examination results of the additional modules will not be considered for calculating the grade.

Students who have acquired more than the required number of ECTS credits in a particular section are to provide the Examination Office with written notification of the modules to be considered for calculating the section grade within five days of receipt of the last examination result. This notification must be signed by the student. If a student does not notify the Examination Office of the modules to be considered, or fails to do so in good time, the modules with the best grades will be used for the calculation.

§ 12
Academic title

The student is awarded the academic degree of Master of Science (M.Sc.) if he or she has passed the Master’s examination.

§ 13
Examination Board

(1) The Electrical Engineering and Information Technology Examination Board is responsible for the organisation of examinations in accordance with these Examination Regulations, as well as for the tasks allocated by these Examination Regulations. The business of the Examination Board is managed by the relevant Examination Office.

(2) The Examination Board consists of four members from the university lecturers' group, one member from the scientific staff group and two members of the student body.

§ 14
Transitional provisions of the new version of 15 July 2021

(1) A qualification in accordance with the relevant degree-specific examination regulations is possible until 30 September 2024 for students who, at the time these Examination Regulations enter into force, are registered at Kiel University for the Master of Science (M.Sc.) degree programme in Electrical Engineering and Information Technology, and who are studying according to the degree-specific examination regulations that expired in accordance with §15 (2).

(2) If modules are offered in a different form, these must be completed under the new version. Students can apply to change to the new degree-specific examination regulations. The possibility of voluntary change exists until 30 September 2022. Module examinations and their ECTS credits that have been completed and passed in full by the date these Rules enter into force will remain valid.

(3) Students continuing their degree programme under the old degree-specific examination regulations expiring according to §15 (2) will automatically switch to the new Examination Regulations as of the winter semester 2024/25.

(4) If a student has completed and passed independent parts of a module examination in accordance with (2) or (3) above, these partial achievements will be recognised accordingly. The Examination Board determines which additional examinations are necessary to complete the module, under consideration of the module's learning targets and the purpose of the examination.

(5) Examinations failed before these Rules entered into force will be set off against the number of attempts allowed under the new Examination Regulations, provided the structure of the new module examinations permits recognition.

(6) The Examination Board decides regarding special cases of hardship for which the student is not responsible.

§ 14a

Transitional provisions of the amendment of 8 August 2022

For students who enrolled in a first or higher semester of this degree program prior to 1 October 2022 the previous overall grade calculation policy will apply.

§ 15
Entry into force, expiry

(1) These rules enter into force on 1 April 2022. They apply to students who register for the summer semester 2022 or later for the first or for a higher semester for this degree programme.

(2) At the same time, the previous Examination Regulations (Rules) of the Faculty of Engineering at Christian-Albrechts-Universität zu Kiel (Kiel University) for students of 'Electrical Engineering and Information Technology' leading to a Master of Science degree (M.Sc.) – 2019 of 21 November 2018 (NBl. HS MSGWG Schl.-H., p. 77), last amended by the Rules of 20 July 2020 (NBl. HS MBWK Schl.-H., p. 55), cease to be in force.

The University Board at Kiel University granted its approval in accordance with § 52 (1) 1. of the Schleswig-Holstein Higher Education Act (HSG) in its letter dated 14 July 2021.

Kiel, 15 July 2021

Prof. Dr Lorenz Kienle
Dean of the Faculty of Engineering
at Kiel University

Article 2 of the amended Examination Regulations of 8 August 2022
This rules enter into force on 1 October 2022.

Article 2 of the amended Examination Regulations of 15 February 2023
This rules enter into force on 20 April 2023.

Article 2 of the amended Examination Regulations of 20 July 2023
These Examination Regulations enter into force on the day following their annoucement.

Annex 1: Study schedule

FS	Module code	Module title	LF	SWS	P/ WP	ZV	PVL	PL	LP
1st and 2nd MF	etit5xxx-xx	Core module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit5xxx-xx	Core module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit5xxx-xx	Core module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit6xxx-xx	Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit6xxx-xx	Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit6xxx-xx	Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit5xxx-xx oder etit6xxx-xx	Core module or Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit5xxx-xx oder etit6xxx-xx	Core module or Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit5xxx-xx oder etit6xxx-xx	Core module or Advanced module	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit7xxx-xx	Seminar*	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit8xxx-xx	Practical* or Project* (Part 1)	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
	etit7xxx-xx oder etit8xxx-xx	Seminar* or Practical* oder Project* (Part 2)	j.n.M.	j.n.M.	WP		j.n.M.	j.n.M.	5
									Σ 60
3rd MF		Master's thesis							30
									Σ 30
									Σ 90

* In modules whose module titles are marked with an "*", attendance is compulsory in the courses.

Explanations:

FS: Fachsemester (Semester)
Modultitel: Name des Moduls (Name of the module)
LF: Lehrform, Art der Modulveranstaltung(en) (Teaching form, Type of module class)
SWS: Semesterwochenstunden der Modulveranstaltung(en) (= weekly 45-minute teaching units for the duration of one semester of about 12 teaching weeks of the module courses)
P/WP: Status des Moduls (Pflicht/ Wahlpflicht) (Status of the module (compulsory/compulsory elective)
ZV: Zugangsvoraussetzung für das Modul (Admission requirement for the module)
PVL: Prüfungsvorleistung (Zulassungsvoraussetzung zur PL) (Pre-requisite for examination (Admission requirement for PL))
PL: Prüfungsleistung (examination)
LP: Leistungspunkte *(in diesem Semester gutgeschrieben)* (ECTS credits (*credited this semester)*)
∑: Summe (Sum)
MF: Mobilitätsfenster (Mobility window)
j.n.M.: je nach Modul (Depending on module)

Abbreviations for teaching forms:

P: Praktikum (Practical)
PR: Projekt (Project)
PÜ: Praktische Übung (Practical Exercise)
S: Seminar (Seminar)
Ü: Übung (Practical exercise)
V: Vorlesung (Lecture)

Abbreviations for examinations:

A: Arbeitsbericht (Work report)
D: Demonstration (Demonstration)
H: Hausarbeit (Assignment)
K: Klausur (Written examination)
KoM: Klausur oder mündliche Prüfung (Written or oral examination)
KQ: Kolloquium (Colloquium)
MP: Mündliche Prüfung (Oral examination)
OT: Online-Test (Online test)
P: Paper (Paper)
PA: Praktische Aufgabe (Practical exercise
PR: Protokoll (Protocol)
S: Schriftliche Ausarbeitung (Written elaboration)
T: Test
V: Versuchsdurchführung (Conducting an experiment)
VO: Vortrag (Presentation)

Information about examination requirements:

- In the case of etit modules: see Annex 2
- In the case of the modules of other subjects: see module handbook

Annex 2: Overview of modules with prerequisites for admission to examinations

For admission to the examination, the following modules require prerequisites:

Module code	Module title	Prerequisite
etit6003-01a	Adaptive Filters	Presentation
etit6014-01a	Pattern Recognition and Machine Learning	Presentation
etit6029-01a	Wireless Power Transfer and Smart Grid Communications	Presentation
etit8012-01a	M.Sc. Lab Biological Information Pathways and Processing	Test as part of the module etit5020-01a

Appendix: Date: 15.05.2023
(not part of the Rules)

Module and Specialisations
Master's Degree Programme in
Electrical and Information Engineering

Glossary

Compulsory – Pflicht
Compulsory Module – Pflichtmodul
Compulsory Elective – Wahlpflicht
Compulsore Elective Module - Wahlpflichtmodul
Contact Hours per week (weekly 45-minute teaching units) – Semesterwochenstunden (SWS)
Core Module - Kernmodul
Course Type – Lehrform

Duration – Dauer

ECTS Credits – Leistungspunkte (LP)
Evaluation – Bewertungsart
Examination – Prüfungsleistung
Exercise – Übung

Graded – benotet

In-depth Module - Vertiefungsmodul

Lab Course / Laboratory Course – Praktikum
Lecture – Vorlesung

Module Course – Modullehrveranstaltung

None – keine
Not Graded – unbenotet

Oral Examination – Mündliche Prüfung

Practical Exercise – Praktische Übung
Practical Task – Praktische Aufgabe
Prerequisites - Zulassungsvoraussetzungen
Project – Projekt

Semester – Semesterlage
Seminar - Seminar
Summer Semester – Sommersemester (SoSe)
Status – Status

Test - Test

Weighting – Gewichtung
Workload – Arbeitsaufwand
Winter Semester – Wintersemester (WiSe)
Written Examination – Klausur

1. Core Modules (Kernmodule)

etit5001-01a	**Advanced Digital Signal Processing (PNR 21100, Schmidt; Spezialisierung: B1, B3, B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Advanced Digital Signal Processing	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 21110)	Graded	100 %
etit5002-01a	**Design of Power Electronics Converters (PNR 21200, Liserre; Spezialisierung: B2, B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Design of Power Electronics Converters	Lecture + Exercise	2 + 1,5	Compulsory	Written or Oral Examination (PNR 21210)	Graded	100 %
etit5003-01a	**Digital Communications II (PNR 21300, Pachnicke; Spezialisierung: B3; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Digital Communications II	Lecture + Exercise	2 + 2	Compulsory	Written Examination (PNR 21310)	Graded	100 %
etit5004-01a	**Digital Electronics (PNR 21400, Kohlstedt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Digital Electronics	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 21410)	Graded	100 %
etit5005-01a	**Fields and Waves in Biological Systems (PNR 21500, Klinkenbusch; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Fields and Waves in Biological Systems	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 21510)	Graded	100 %

etit5006-01a	**Fundamentals of Electronic Device Fabrication Technology (PNR 21600, Kohlstedt; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Fundamentals of Electronic Device Fabrication Technology	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 21610)	Graded	100 %
etit5007-01a	**Information Theory and Coding I (PNR 21700, Höher; Spezialisierung: B3; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Information Theory and Coding I	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 21710)	Graded	100 %
etit5008-01a	**Information Theory and Coding II (PNR 21800, Höher; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Information Theory and Coding II	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 21810)	Graded	100 %
etit5009-01a	**Mathematical Methods in Field Theory (PNR 21900, Klinkenbusch; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Mathematical Methods in Field Theory	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 21910)	Graded	100 %
etit5010-01a	**Microwave Circuits and Systems: Passive Circuits (PNR 22000, Höft; Spezialisierung: B2; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microwave Circuits and Systems: Passive Circuits	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 22010)	Graded	100 %

etit5011-01a	**Modeling and Control of Power Electronics Converters (PNR 22100, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Modeling and Control of Power Electronics Converters	Lecture + Exercise	2 + 1,5	Compulsory	Written Examination (PNR 22110)	Graded	100 %
etit5012-01a	**Neuromorphic Engineering (PNR 22200, Kohlstedt; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Neuromorphic Engineering	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 22210)	Graded	100 %
etit5013-01a	**Nonlinear Control Systems (PNR 22300, Meurer; Spezialisierung: B1, B4, B5; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Nonlinear Control Systems	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 22310)	Graded	100 %
etit5014-01a	**Optical Communications (PNR 22400, Pachnicke; Spezialisierung: B3; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Optical Communications	Lecture + Exercise	3 + 1	Compulsory	Written or Oral Examination (PNR 22410)	Graded	100 %
etit5015-01a	**Optimization and Optimal Control (PNR 22500, Meurer; Spezialisierung: B1, B5; Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Optimization and Optimal Control	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 22510)	Graded	100 %

etit5016-01a	Wireless Communications (PNR 22600, Höher; Spezialisierung: B3)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Wireless Communications	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 22610)	Graded	100 %
etit5017-01a	**Introduction to Low-power CMOS System Design (PNR 22700, Rieger; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Introduction to Low-power CMOS System Design	Lecture + Exercise	2 + 1	Compulsory	Written Examination or Online-Test (PNR 22710)	Graded	100 %
etit5018-01a	**Rigid Body Dynamics and Robotics (PNR 22800, Meurer; Spezialisierung: B1; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Rigid Body Dynamics and Robotics	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 22810)	Graded	100 %
etit5019-01a	**Semiconductor Technology (PNR 22900, Kapels)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Semiconductor Technology	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 22910)	Graded	100 %
etit5020-01a	**Bio-inspired Information Pathways (PNR 23100, Kohlstedt; Spezialisierung:)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Bio-inspired Information Pathways	Lecture + Exercise	3 + 2	Compulsory	Written or Oral Examination (PNR)	Graded	100 %

Inf-IngNum	**Numerische Mathematik in den Ingenieurwissenschaften (Import aus der Mathematik; verfügbar im SoSe 2023 und SoSe 2024)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	6 / 180	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Numerische Mathematik in den Ingenieurwissen-schaften	Lecture + Exercise	2 + 2	Compulsory	Written or Oral Examination	Graded	100 %
mathNMfdl-01a	**Numerische Mathematik für die Ingenieurwissenschaften (Import aus der Mathematik; verfügbar im SoSe 2025)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Numerische Mathematik für die Ingenieur-wissenschaften	Lecture + Exercise	2 + 2	Compulsory	Written or Oral Examination	Graded	100 %

2. In-depth Modules (Vertiefungsmodule)

etit6003-01a	**Adaptive Filters (PNR 26300, Schmidt; Spezialisierung: B1, B3; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Presentation	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Adaptive Filters	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 26310)	Graded	100 %
etit6004-01a	**Applied Nonlinear Dynamics (PNR 26400, Meurer; Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Applied Nonlinear Dynamics	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26410)	Graded	100 %
etit6005-01a	**Computational Electromagnetics (PNR 26500, Klinkenbusch; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Computational Electromagnetics	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26510)	Graded	100 %
etit6006-01a	**Control of PDE Systems (PNR 26600, Meurer; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Control of PDE Systems	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26610)	Graded	100 %
etit6007-01a	**Electric Drives (PNR 26700, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Electric Drives	Lecture + Exercise	2 + 1,5	Compulsory	Oral Examination (PNR 26710)	Graded	100 %

etit6008-01a	Fiber-optic Communication Networks (PNR 26800, Pachnicke; Spezialisierung: B3; Export: MA Mathematik)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Fiber-optic Communication Networks	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 26810)	Graded	100 %
etit6009-01a	**Grid Converters for Renewable Energy Systems (PNR 26900, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Grid Converters for Renewable Energy Systems	Lecture + Exercise	2 + 1,5	Compulsory	Oral Examination (PNR 26910)	Graded	100 %
etit6010-01a	**Interface and Surface Analysis Methods in Materials Science (PNR 27000, Kohlstedt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Interface and Surface Analysis Methods in Materials Science	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 27010)	Graded	100 %
etit6011-01a	**Microwave Circuits and Systems: Active Circuits (PNR 27100, Höft; Spezialisierung: B2; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microwave Circuits and Systems: Active Circuits	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 27110)	Graded	100 %
etit6012-01a	**Microwave Filters: Theory, Design, and Realization (PNR 27200, Höft)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microwave Filters: Theory, Design, and Realization	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 27210)	Graded	100 %

etit6013-01a	**Noise in Communications and Measurement Systems (PNR 27300, Höft; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Noise in Communications and Measurement Systems	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 27310)	Graded	100 %
etit6014-01a	**Pattern Recognition and Machine Learning (PNR 27400, Schmidt; Spezialisierung: B1, B4; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Presentation	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Pattern Recognition and Machine Learning	Lecture + Exercise	3 + 1	Compulsory	Written or Oral Examination (PNR 27410)	Graded	100 %
etit6015-01a	**Photonic Components (PNR 27500, Gerken; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Photonic Components	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 27510)	Graded	100 %
etit6016-01a	**Renewable Energy Systems (PNR 27600, Liserre)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Renewable Energy Systems	Lecture + Exercise	2 + 1,5	Compulsory	Oral Examination (PNR 27610)	Graded	100 %
etit6017-01a	**Tomographical Methods for Medicine (PNR 27700, Klinkenbusch; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Tomographical Methods for Medicine	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 27710)	Graded	100 %

etit6018-01a	**Integrated Circuit Design for Medical Applications (PNR 27800, Bahr; Spezialisierung: B2, B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Integrated Circuit Design for Medical Applications	Lecture + Exercise	2 + 2	Compulsory	Written or Oral Examination (PNR 27810)	Graded	100 %
etit6019-01a	**Design and Analysis of Selected Fundamental CMOS Circuits (PNR 27900, Rieger)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Design and Analysis of Selected Fundamental CMOS Circuits	Lecture	2	Compulsory	Presentation (PNR 27910)	Graded	100 %
etit6020-01a	**Wide-bandgap Semiconductors (PNR 28000, Kapels; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Wide-bandgap Semiconductors	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 28010)	Graded	100 %
etit6021-01a	**Advanced Methods in Nonlinear Control (PNR 28100, Meurer; Spezialisierung: B1, B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Advanced Methods in Nonlinear Control	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 28110)	Graded	100 %
etit6022-01a	**Numerical Simulation of Analog and Digital Communication Systems (PNR 28200, Pachnicke; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Numerical Simulation of Analog and Digital Communication Systems	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 28210)	Graded	100 %

etit6023-01a	Control of Robot Systems (PNR 28300, Meurer; Spezialisierung: B1; Export: MA Mathematik)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Control of Robot Systems	Lecture + Exercise	2 + 1	Compulsory	Take-home Examination and Oral Examination (PNR 28310)	Graded	100 %
etit6024-01a	**Fundamentals of Acoustics (PNR 28400, Schmidt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Fundamentals of Acoustics	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 28410)	Graded	100 %
etit6025-01a	**Introduction to Radar Signal Processing and Algorithms (PNR 28500, Höher)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Introduction to Radar Signal Processing and Algorithms	Lecture + Exercise	3 + 1	Compulsory	Written or Oral Examination (PNR 28510)	Graded	100 %
etit6026-01a	**Underwater Techniques (PNR 28600, Höher)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Underwater Techniques	Lecture + Exercise + Practical Exercise	2 + 1 + 1	Compulsory	Laboratory Task (Programming and Report) as well as Written or Oral Examination (PNR 28610)	Graded	30 % 70 %

etit6027-01a	Digital Audio Effects (PNR 28700, Schmidt)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Digital Audio Effects	Lecture + Exercise	2,5 + 1,5	Compulsory	Oral Examination (PNR 28710)	Graded	100 %
etit6028-01a	**Time Series Analysis (PNR 28800, Höher)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Time Series Analysis	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 28810)	Graded	100 %
etit6029-01a	**Wireless Power Transfer and Smart Grid Communications (PNR 28900, Höher; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Presentation	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Wireless Power Transfer and Smart Grid Communications	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 28910)	Graded	100 %
etit6030-01a	**Visible Light Communications (PNR 29000, Höher; Spezialisierung: B3)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Visible Light Communications	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 29010)	Graded	100 %
etit6031-01a	**Enabling Technologies for the Industrial Internet of Things (PNR 29100, Klinkenbusch)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Enabling Technologies for the Industrial Internet of Things	Lecture + Exercise + Practical Exercise	2 + 1 + 1	Compulsory	Written Examination (PNR 29110)	Graded	100 %

etit6032-01a	Design Space Exploration for Unmanned Systems (PNR 29200 Schmidt)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Design Space Exploration for Unmanned Systems	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 29210)	Graded	100 %
etit6033-01a	**Microcontroller and FPGA Technique for Power Electronics Applications (PNR 29300; Liserre)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microcontroller and FPGA Technique for Power Electronics Applications	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 29310)	Graded	100 %
etit6034-02a	**Battery Technologies, Manufacturing, Modelling, Control and Integration in Power Electronics (PNR 29401; Liserre)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
3. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Battery Technologies, Manufacturing, Modelling, Control and Integration in Power Electronics	Lecture	2	Compulsory	Orals Examination (PNR 29420)	Graded	100 %
etit6035-01a	**Essential Numerical Methods (PNR 29500; Trieschmann)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Essential Numerical Methods	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 29510)	Graded	100 %

etit6036-01a	Swarm Communication and Navigation (PNR 29600; Höher)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Swarm Communication and Navigation	Lecture + Exercise	2 + 1,5	Compulsory	Oral Examination (PNR 29610)	Graded	100 %
mathMIng4e-01a	**Advanced Engineering Mathematics (PNR 90100; Import aus der Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	according to module handbook	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Advanced Engineering Mathematics	Lecture + Exercise	2 + 1	Compulsory	Written or Oral Examination (PNR 90110)	Graded	100 %
mathNumPDEp-01a	**Numerical Methods for Partial Differential Equations (Profilbildung) (PNR 44001; Import aus der Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	according to module handbook	10 / 300	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Numerical Methods for Partial Differential Equations (Profilbildung)	Lecture + Exercise	4 + 2	Compulsory	Written or Oral Examination (PNR 44020)	Graded	100 %

3. Seminars (Seminare)

etit7001-01a	**Seminar Advanced Topics in Microwave Technologies (PNR 35100, Höft)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Advanced Topics in Microwave Technologies	Seminar	2	Compulsory	Presentation and Paper (PNR 35110)	Not Graded	0 %
etit7002-01a	**Seminar Analysis of Scientific Papers (PNR 35200, Kohlstedt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Analysis of Scientific Papers	Seminar	3	Compulsory	Presentation and Paper (PNR 35210)	Not Graded	0 %
etit7003-01a	**Seminar Communications (PNR 35300, Pachnicke; Spezialisierung: B3, B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Communications	Seminar	3	Compulsory	Presentation and Paper (PNR 35310)	Not Graded	0 %
etit7004-01a	**Seminar on Information Theory and Coding (PNR 35400, Höher; Spezialisierung: B3)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Information Theory and Coding	Seminar	3	Compulsory	Presentation and Paper (PNR 35410)	Not Graded	0 %
etit7005-01a	**Seminar Integrated Systems and Photonics (PNR 35500, Gerken)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Integrated Systems and Photonics	Seminar	2	Compulsory	Presentation (PNR 35510)	Not Graded	0 %

etit7006-01a	Seminar Nanoelectronics (PNR 35600, Kohlstedt; Spezialisierung: B2)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Nanoelectronics	Seminar	3	Compulsory	Presentation and Paper (PNR 35610)	Not Graded	0 %
etit7007-01a	**Seminar on Current Topics in Biomedical Engineering (PNR 35700, Klinkenbusch; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Current Topics in Biomedical Engineering	Seminar	3	Compulsory	Presentation and Paper (PNR 35710)	Not Graded	0 %
etit7009-01a	**Seminar on Selected Topics in Systems and Control (PNR 35900, Meurer; Spezialisierung: B1, B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Selected Topics in Systems and Control	Seminar	2	Compulsory	Presentation and Paper (PNR 35910)	Not Graded	0 %
etit7010-01a	**Seminar Power Electronics (PNR 36000, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Power Electronics	Seminar	2	Compulsory	Presentation and Paper (PNR 36010)	Not Graded	0 %
etit7011-01a	**Seminar X-ray Diffraction Methods for Thin Film Analysis (PNR 36100, Kohlstedt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar X-ray Diffraction Methods for Thin Film Analysis	Lecture + Practical Exercise + Seminar	1 + 1 + 1	Compulsory	Presentation (PNR 36110)	Not Graded	0 %

etit7012-01a	Seminar Selected Topics in Medical Electronics (PNR 36200, Bahr; Spezialisierung: B2)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar Selected Topics in Medical Electronics	Seminar	2	Compulsory	Presentation and Paper (PNR 36210)	Not Graded	0 %
etit7013-01a	**Seminar on Selected Topics in Speech and Audio Signal Processing (PNR 36300, Schmidt; Spezialisierung: B1)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Selected Topics in Speech and Audio Signal Processing	Seminar	2	Compulsory	Presentation and Paper (PNR 36310)	Not Graded	0 %
etit7014-01a	**Seminar on Selected Topics in Medical Signal Processing (PNR 36400, Schmidt; Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Selected Topics in Medical Signal Processing	Seminar	2	Compulsory	Presentation and Paper (PNR 36410)	Not Graded	0 %
etit7015-01a	**Seminar on Selected Topics in Underwater Signal Processing (PNR 36500, Schmidt; Spezialisierung: B3)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Seminar on Selected Topics in Underwater Signal Processing	Seminar	2	Compulsory	Presentation and Paper (PNR 36510)	Not Graded	0 %

4. Laboratory Courses and Projects (Praktika und Projekte)

etit8001-01a	**M.Sc. Laboratory Advanced Control (PNR 38100, Meurer; Spezialisierung: B1; Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Advanced Control	Practical Exercise	4	Compulsory	Colloquia, Practical Tasks and Protocols (PNR 38110)	Not Graded	0 %
etit8002-01a	**M.Sc. Laboratory Communications (PNR 38200, Pachnicke; Spezialisierung: B3)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Communications	Practical Exercise	4	Compulsory	Colloquia and Practical Tasks (PNR 38210)	Not Graded	0 %
etit8003-01a	**M.Sc. Laboratory Information Processing (PNR 38300, Höher, Pachnicke, Schmidt; Spezialisierung: B3)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Information Processing	Practical Exercise	4	Compulsory	Colloquia and Practical Tasks (PNR 38310)	Not Graded	0 %
etit8004-01a	**M.Sc. Laboratory Microwave Technology and Electromagnetic Compatibility (PNR 38400, Höft, Spezialisierung: B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Microwave Technology and Electromagnetic Compatibility	Practical Exercise	4	Compulsory	Colloquia, Practical Tasks and Protocols (PNR 38410)	Not graded	0 %

etit8005-01a	M.Sc. Laboratory Optoelectronics (PNR 38500, Gerken)					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Optoelectronics	Practical Exercise	3	Compulsory	Colloquia, Practical Tasks, Reports and Presentation (PNR 38510)	Not Graded	0 %
etit8006-01a	**M.Sc. Laboratory Power Electronics - Renewable Energy - Drive Engineering (PNR 38600, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Power Electronics - Renewable Energy - Drive Engineering	Practical Exercise	5	Compulsory	Colloquia, Practical Tasks and Protocols (PNR 38610)	Not Graded	0 %
etit8007-01a	**M.Sc. Laboratory Real-time Signal Processing (PNR 38700, Höher, Pachnicke, Schmidt; Spezialisierung: B1, B3, B4)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Real-time Signal Processing	Practical Exercise	4	Compulsory	Practical Task, Presentation and Paper (PNR 38710)	Not Graded	0 %
etit8008-01a	**M.Sc. Laboratory Examples in Computerized IC Testing (PNR 38800, Rieger; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Examples in Computerized IC Testing	Practical Exercise + Seminar	2 + 1	Compulsory	Report or Oral Examination (PNR 38810)	Not Graded	0 %

etit8009-01a	**M.Sc. Laboratory Digital Circuit Design (PNR 38900, Bahr; Spezialisierung: B2)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Digital Circuit Design	Lecture + Practical Exercise	1 + 3	Compulsory	Report and Presentation (PNR 38910)	Not Graded	0 %
etit8010-01a	**M.Sc. Project Power Electronics, Control and Communications in Energy Systems (PNR 39000, Liserre; Spezialisierung: B5)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	10 / 300	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc Project Power Electronics, Control and Communications in Energy Systems	Project	10	Compulsory	Report and Presentation (PNR 39010)	Not Graded	0 %
etit8011-01a	**M.Sc. Laboratory Machine Learning (PNR 39100, Schmidt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Machine Learning	Practical Exercise	4	Compulsory	Practical Task and Presentation (PNR 39110)	Not Graded	0 %
etit8012-01a	**M.Sc. Lab Biological Information Pathways and Processing (PNR 39200, Kohlstedt)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Test as part of the module etit5020-01a	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Lab Biological Information Pathways and Processing	Practical Exercise	2,5	Compulsory	Colloquia, Practical Tasks and Protocols (PNR 39210)	Not Graded	0 %

5. Curricula with specialisation

B1. Specialisation in 'Automation and Control'

Core modules for specialisation in Automation and Control
At least 3 of the following 4 compulsory elective modules must be taken:
- Advanced Digital Signal Processing (etit5001-01a, 5 ECTS, WiSe)
- Rigid Body Dynamics and Robotics (etit5018-01a, 5 ECTS, WiSe)
- Nonlinear Control Systems (etit5013-01a, 5 ECTS, SuSe)
- Optimization and Optimal Control (etit5015-01a, 5 ECTS, WiSe)

In-depth modules for specialisation in Automation and Control
At least 3 of the following 4 compulsory elective modules must be taken:
- Adaptive Filters (etit6003-01a, 5 ECTS, SuSe)
- Advanced Methods in Nonlinear Control (etit6021-01a, 5 ECTS, WiSe)
- Control of Robot Systems (etit6023-01a, 5 ECTS, SuSe)
- Pattern Recognition and Machine Learning (etit6014-01a, 5 ECTS, WiSe)

Additional core and in-depth modules
Within the specialisation in 'Automation and System Theory' all modules in the module groups 5000 and 6000 not included in the sections 'Core modules for specialisation in Automation and System Theory' or 'In-depth modules for specialisation in Automation and System Theory' are allocated to the section 'Additional core and in-depth modules'.
In the section 'Additional core and in-depth modules', enough modules are to be selected from the module groups 5000 (core modules) and 6000 (in-depth modules) to achieve a total of 45 ECTS credits from the three sections 'Core modules for specialisation in Automation and Control', 'In-depth modules for specialisation in Automation and Control' and 'Additional core and in-depth modules'.

Seminars for specialisation in Automation and Control
A total of 3 modules must be taken in the sections 'Seminars for specialisation in Automation and Control' and 'Laboratory courses and projects for specialisation in Automation and Control'. In the section 'Seminars for specialisation in Automation and Control' at least 1 of the following 2 compulsory elective modules must be taken:
- Seminar on Selected Topics in Systems and Control (etit7009-01a, 5 LP, WiSe oder SoSe)
- Seminar on Selected Topics in Speech and Audio Signal Processing (etit7013-01a, 5 LP, WiSe)

Laboratory courses and projects for specialisation in Automation and Control
A total of 3 modules must be taken in the sections 'Seminars for specialisation in Automation and Control' and 'Laboratory courses and projects for specialisation in Automation and Control'. In the section 'Laboratory courses and projects for specialisation in Automation and Control' at least 1 of the following 2 compulsory elective modules must be taken:
- M.Sc. Laboratory Advanced Control (etit8001-01a, 5 LP, WiSe)
- M.Sc. Laboratory Real-time Signal Processing (etit8007-01a, 5 LP, SuSe)

B2. Specialisation in 'Devices and Circuits'

Core modules for specialisation in Devices and Circuits

At least 3 of the following 4 compulsory elective modules must be taken:

- Design of Power Electronics Converters (etit5002-01a, 5 ECTS, SuSe)
- Fundamentals of Electronic Device Fabrication Technology (etit5006-01a, 5 ECTS, WiSe)
- Introduction to Low-power CMOS System Design (etit5017-01a, 5 ECTS, SuSe)
- Microwave Circuits and Systems: Passive Circuits (etit5010-01a, 5 ECTS, SuSe)

In-depth modules for specialisation in Devices and Circuits

At least 3 of the following 4 compulsory elective modules must be taken:

- Integrated Circuits for Medical Applications (etit6018-01a, 5 ECTS, WiSe)
- Microwave Circuits and Systems: Active Circuits (etit6011-01a, 5 ECTS, WiSe)
- Photonic Components (etit6015-01a, 5 ECTS, WiSe)
- Wide-bandgap Semiconductors (etit6020-01a, 5 ECTS, WiSe)

Additional core and in-depth modules

Within the specialisation in 'Devices and Circuits' all modules in the 5000 and 6000 module groups not included in the sections 'Core modules for specialisation in Devices and Circuits' or 'In-depth modules for specialisation in Devices and Circuits' are allocated to the section 'Additional core and in-depth modules'.
In the section 'Additional core and in-depth modules', enough modules are to be selected from the module groups 5000 (core modules) and 6000 (in-depth modules) to achieve a total of 45 ECTS credits from the three sections 'Core modules for specialisation in Devices and Circuits', 'In-depth modules for specialisation in Devices and Circuits' and 'Additional core and in-depth modules'.

Seminars for specialisation in Devices and Circuits

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Devices and Circuits' and 'Laboratory courses and projects for specialisation in Devices and Circuits'. In the section 'Seminars for specialisation in Devices and Circuits' at least 1 of the following 2 compulsory elective modules must be taken:

- Seminar Nanoelectronics (etit7006-01a, 5 ECTS, WiSe or SuSe)
- Seminar Selected Topics in Medical Electronics (etit7012-01a, 5 ECTS, WiSe)

Laboratory courses and projects for specialisation in Devices and Circuits

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Devices and Circuits' and 'Laboratory courses and projects for specialisation in Devices and Circuits'. In the section 'Laboratory courses and projects for specialisation in Devices and Circuits' at least 1 of the following 2 compulsory elective modules must be taken:

- M.Sc. Laboratory Digital Circuit Design (etit8009-01a, 5 ECTS, Semester, WiSe)
- M.Sc. Laboratory Examples in Computerized IC Testing (etit8008-01a, 5 ECTS, SuSe)

B3. Specialisation in 'Digital Communications'

Core modules for specialisation in Digital Communications

At least 3 of the following 5 compulsory elective modules must be taken:

- Advanced Digital Signal Processing (etit5001-01a, 5 ECTS, WiSe)
- Digital Communications II (etit5003-01a, 5 ECTS, WiSe)
- Information Theory and Coding I (etit5007-01a, 5 ECTS, WiSe)
- Optical Communications (etit5014-01a, 5 ECTS, SuSe)
- Wireless Communications (etit5016-01a, 5 ECTS, SuSe)

In-depth modules for specialisation in Digital Communications

The following 3 compulsory modules must be taken:

- Visible Light Communications (etit6030-01a, 5 LP, WiSe)
- Adaptive Filters (etit6003-01a, 5 LP, SuSe)
- Fiber-optic Communication Networks (etit6008-01a, 5 LP, SuSe)

Additional core and in-depth modules

Within the specialisation in 'Digital Communications' all modules in the 5000 and 6000 module groups not included in the sections 'Core modules for specialisation in Digital Communications' or 'In-depth modules for specialisation in Digital Communications' are allocated to the section 'Additional core and in-depth modules'.
In the section 'Additional core and in-depth modules', enough modules are to be selected from the module groups 5000 (core modules) and 6000 (in-depth modules) to achieve a total of 45 ECTS credits from the three sections 'Core modules for specialisation in Digital Communications', 'In-depth modules for specialisation in Digital Communications' and 'Additional core and in-depth modules'.

Seminars for specialisation in Digital Communications

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Digital Communications' and 'Laboratory courses and projects for specialisation in Digital Communications'. In the section 'Seminars for specialisation in Digital Communications' at least 1 of the following 3 compulsory elective modules must be taken:

- Seminar on Information Theory and Coding (etit7004-01a, 5 LP, WiSe or SuSe)
- Seminar Communications (etit7003-01a, 5 LP, WiSe or SuSe)
- Seminar on Selected Topics in Underwater Signal Processing (etit7015-01a, 5 LP, SoSe)

Laboratory courses and projects for specialisation in Digital Communications

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Digital Communications' and 'Laboratory courses and projects for specialisation in Digital Communications'. In the section 'Laboratory courses and projects for specialisation in Digital Communications' at least 1 of the following 3 compulsory elective modules must be taken:

- M.Sc. Laboratory Communications (etit8002-01a, 5 ECTS, SuSe)
- M.Sc. Laboratory Real-time Signal Processing (etit8007-01a, 5 ECTS, SuSe)
- M.Sc. Laboratory Information Processing (etit8003-01a, 5 ECTS, WiSe)

B4. Specialisation in 'Medical Applications'

Core modules for specialisation in Medical Applications

At least 3 of the following 4 compulsory elective modules must be taken:

- Advanced Digital Signal Processing (etit5001-01a, 5 ECTS, WiSe)
- Fields and Waves in Biological Systems (etit5005-01a, 5 ECTS, SuSe)
- Neuromorphic Engineering (etit5012-01a, 5 ECTS, WiSe)
- Nonlinear Control (etit5013-01a, 5 ECTS, SuSe)

In-depth modules for specialisation in Medical Applications

At least 3 of the following 4 compulsory elective modules must be taken:

- Integrated Circuit Design for Medical Applications (etit6018-01a, 5 ECTS, WiSe)
- Noise in Communications and Measurement Systems (etit6013-1a, 5 ECTS, SuSe)
- Pattern Recognition (etit6014-01a, 5 ECTS, WiSe)
- Tomographic Methods for Medicine (etit6017-01a, 5 ECTS, WiSe)

Additional core and in-depth modules

Within the specialisation in 'Medical Applications' all modules in the 5000 and 6000 module groups not included in the sections 'Core modules for specialisation in Medical Applications' or 'In-depth modules for specialisation in Medical Applications' are allocated to the section 'Additional core and in-depth modules'.
In the section 'Additional core and in-depth modules', enough modules are to be selected from the module groups 5000 (core modules) and 6000 (in-depth modules) to achieve a total of 45 ECTS credits from the three sections 'Core modules for specialisation in Medical Applications', 'In-depth modules for specialisation in Medical Applications' and 'Additional core and in-depth modules'.

Seminars for specialisation in Medical Applications

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Medical Applications' and 'Laboratory courses and projects for specialisation in Medical Applications'. In the section 'Seminars for specialisation in Medical Applications' at least 1 of the following 2 compulsory elective modules must be taken:

- Seminar on Current Topics in Biomedical Engineering (etit7007-01a, 5 LP, SuSe)
- Seminar on Selected Topics in Medical Signal Processing (etit7014-01a, 5 LP, WiSe)

Laboratory courses and projects for specialisation in Medical Applications

A total of 3 modules must be taken in the sections 'Seminars for specialisation in Medical Applications' and 'Laboratory courses and projects for specialisation in Medical Applications'. In the section 'Laboratory courses and projects for specialisation in Medical Applications' at least 1 of the following 2 compulsory elective modules must be taken:

- M.Sc. Laboratory Microwave Technology and Electromagnetic Compatibility (etit8004-01a, 5 ECTS, WiSe)
- M.Sc. Laboratory Real-time Signal Processing (etit8007-01a, 5 ECTS, SuSe)

B5. Specialisation in 'Power Electronics, Control and Communications in Energy Systems'

Core modules for specialisation in Power Electronics, Control and Communications in Energy Systems

At least 3 of the following 4 compulsory elective modules must be taken:

- Design of Power Electronics Converters (etit5002-01a, 5 ECTS, SuSe)
- Modeling and Control of Power Electronics Converters (etit5011-01a 5 ECTS, WiSe)
- Nonlinear Control Systems (etit5013-01a, 5 ECTS, SuSe)
- Optimization and Optimal Control (etit5015-01a, 5 ECTS, WiSe)

In-depth modules for specialisation in Power Electronics, Control and Communications in Energy Systems

At least 3 of the following 4 compulsory elective modules must be taken:

- Advanced Methods in Nonlinear Control (etit6021-01a, 5 LP, SuSe)
- Electric Drives (etit6007-01a, 5 LP, SuSe)
- Grid Converters for Renewable Energy Systems (etit6009-01a, 5 LP, WiSe)
- Wireless Power Transfer and Smart Grid Communications (etit6029-01a, 5 LP, SoSe)

Additional core and in-depth modules

Within the specialisation in 'Power Electronics, Control and Communications in Energy Systems' all modules in the 5000 and 6000 module groups not included in the sections 'Core modules for specialisation in Power Electronics, Control and Communications in Energy Systems' or 'In-depth modules for specialisation in Power Electronics, Control and Communications in Energy Systems' are allocated to the section 'Additional core and in-depth modules'.

In the section 'Additional core and in-depth modules', enough modules are to be selected from the module groups 5000 (core modules) and 6000 (in-depth modules) to achieve a total of 45 ECTS credits from the three sections 'Core modules for specialisation in Power Electronics, Control and Communications in Energy Systems', 'In-depth modules for specialisation in Power Electronics, Control and Communications in Energy Systems' and 'Additional core and in-depth modules'.

Seminars for specialisation in Power Electronics, Control and Communications in Energy Systems

A total of 2 modules (one with 5 ECTS credits and one with 10 ECTS credits) must be taken in the sections 'Seminars for specialisation in Power Electronics, Control and Communications in Energy Systems' and 'Laboratory courses and projects for specialisation in Power Electronics, Control and Communications in Energy Systems'.

In the section 'Seminars for specialisation in Power Electronics, Control and Communications in Energy Systems', one of the following 3 compulsory elective modules can be taken:

- Seminar Communications (etit7003-01a, 5 ECTS, WiSe or SuSe)
- Seminar Power Electronics (etit7010-01a, 5 ECTS, WiSe)
- Seminar on Selected Topics in Systems and Control (etit7009-01a, 5 ECTS, SuSe)

Laboratory courses and projects for specialisation in Power Electronics, Control and Communications in Energy Systems

A total of 2 modules must be taken in the sections 'Seminars for specialisation in Power Electronics, Control and Communications in Energy Systems' and 'Laboratory courses and projects for specialisation in Power Electronics, Control and Communications in Energy Systems' (one with 5 LP and one with 10 LP) or 3 modules with 5 LP..

One of the following two compulsory modules must be taken in the section 'Laboratory courses and projects for specialisation in Power Electronics, Control and Communications in Energy Systems'.

- M.Sc. Laboratory Power Electronics - Renewable Energy - Drive Engineering (etit8006-01a, 5 LP, WiSe)
- M.Sc. Project Power Electronics, Control and Communications in Energy Systems (etit8010-01a, 10 LP, SoSe)

Export modules of the Institute for Electrical Engineering and Information Technology

Export to the Master's programme in Mathematics with a minor in Electrical Engineering and Information Technology

Further export modules of the Institute of Electrical Engineering and Information Technology (ET&IT) for the Master's program in Mathematics with a minor in Electrical Engineering and Information Technology can be found in the current subject examination regulations for the Bachelor's program in Electrical Engineering and Information Technology.

Students can freely choose from the entire export offer of the Institute for ET&IT for the minor subject Electrical Engineering and Information Technology in the Master's programme Mathematics modules in the aggregate amount of 20 LP.

etit5003-01a	**Digital Communications II (PNR 21300, Pachnicke, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Digital Communications II	Lecture + Exercise	2 + 2	Compulsory	Written Examination (PNR 21310)	Graded	100 %
etit5007-01a	**Information Theory and Coding I (PNR 21700, Höher, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Information Theory and Coding I	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 21710)	Graded	100 %
etit5008-01a	**Information Theory and Coding II (PNR 21800, Höher, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Information Theory and Coding II	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 21810)	Graded	100 %
etit5009-01a	**Mathematical Methods in Field Theory (PNR 21900, Klinkenbusch, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Mathematical Methods in Field Theory	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 21910)	Graded	100 %

etit5010-01a	**Microwave Circuits and Systems: Passive Circuits (PNR 22000, Höft, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microwave Circuits and Systems: Passive Circuits	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 22010)	Graded	100 %
etit5013-01a	**Nonlinear Control Systems (PNR 22300, Meurer, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Nonlinear Control Systems	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 22310)	Graded	100 %
etit5014-01a	**Optical Communications (PNR 22400, Pachnicke, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Optical Communications	Lecture + Exercise	3 + 1	Compulsory	Written or Oral Examination (PNR 22410)	Graded	100 %
etit5015-01a	**Optimization and Optimal Control (PNR 22500, Meurer, Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Optimization and Optimal Control	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 22510)	Graded	100 %
etit5018-01a	**Rigid Body Dynamics and Robotics (PNR 22800, Meurer, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Rigid Body Dynamics and Robotics	Lecture + Exercise	2 + 1	Compulsory	Written Examination (PNR 22810)	Graded	100 %

etit6003-01a	**Adaptive Filters (PNR 26300, Schmidt, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Presentation	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Adaptive Filters	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 26310)	Graded	100 %
etit6004-01a	**Applied Nonlinear Dynamics (PNR 26400, Meurer, Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Applied Nonlinear Dynamics	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26410)	Graded	100 %
etit6005-01a	**Computational Electromagnetics (PNR 26500, Klinkenbusch, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Computational Electromagnetics	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26510)	Graded	100 %
etit6006-01a	**Control of PDE Systems (PNR 26600, Meurer, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Control of PDE Systems	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26610)	Graded	100 %
etit6008-01a	**Fiber-optic Communication Networks (PNR 26800, Pachnicke, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Fiber-optic Communication Networks	Lecture + Exercise	2 + 2	Compulsory	Oral Examination (PNR 26810)	Graded	100 %

etit6011-01a	**Microwave Circuits and Systems: Active Circuits (PNR 27100, Höft, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Microwave Circuits and Systems: Active Circuits	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 27110)	Graded	100 %
etit6014-01a	**Pattern Recognition and Machine Learning (PNR 27400, Schmidt, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	Presentation	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Pattern Recognition and Machine Learning	Lecture + Exercise	3 + 1	Compulsory	Written or Oral Examination (PNR 27410)	Graded	100 %
etit6022-01a	**Numerical Simulation of Analog and Digital Communication Systems (PNR 28200, Pachnicke, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Numerical Simulation of Analog and Digital Communication Systems	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 28210)	Graded	100 %
etit6023-01a	**Control of Robot Systems (PNR 28300, Meurer, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Control of Robot Systems	Lecture + Exercise	2 + 1	Compulsory	Take-home Examination and Oral Examination (PNR 28310)	Graded	100 %
etit8001-01a	**M.Sc. Laboratory Advanced Control (PNR 38100, Meurer, Export: MA Mathematik)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
M.Sc. Laboratory Advanced Control	Practical Exercise	4	Compulsory	Colloquia, Practical Tasks and Protocols (PNR 38110)	Not Graded	0 %

Export in den Bereich Fachergänzung des Zentrums für Schlüsselqualifikationen

etit5015-01a	**Optimization and Optimal Control (PNR 22500, Meurer, Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Optimization and Optimal Control	Lecture + Exercise	3 + 1	Compulsory	Oral Examination (PNR 22510)	Graded	100 %
etit6004-01a	**Applied Nonlinear Dynamics (PNR 26400, Meurer, Export: MA Mathematik, ZfS)**					
Semester	**Duration**		**Status**	**Prerequisites**	**ECTS Credits / Workload**	
1. or 2. Semester	1 Semester		Compulsory Elective	None	5 / 150	
Module Courses	**Course Type**	**Contact Hours per Week**	**Status**	**Examination**	**Evaluation**	**Weighting**
Applied Nonlinear Dynamics	Lecture + Exercise	2 + 1	Compulsory	Oral Examination (PNR 26410)	Graded	100 %