ECTS – Information Brochure on the Bachelor / Master Degree Programme
05/2020

Department of Electrical Engineering and Information Technology

Bachelor Programme
Electrical Engineering/ Information Technology

Bachelor Programme
Automation Engineering/ Information Technology International

Master Programme
Electrical Engineering/ Information Technology

Master Programme
Space Electronics

Master Programme
Mechatronics

Ernst-Abbe-Hochschule Jena
University of Applied Sciences

CONTENTS

I.1 Basics about Studying

I.1.1 The academic year

The academic year is divided into two equal semesters – the summer semester and the winter semester. Actual dates may vary according to events at the time. The dates given here serve as a guideline only. Information on the current semester length can be obtained from the Admission and Registrar's Office (Studentensekretariat) and the UAS Jena website.

Winter semester:

Winter semester:	October to March
Examination period:	February
free period:	March

Summer semester:

Summer semester:	April to September
Examination period:	July to the begin of August
free period:	August to the end of September

Holidays:

Christmas holidays:	two weeks before the end of December (including Christmas Eve and New Year's Eve)
Easter:	Good Friday and Easter Monday
German Labour Day:	1 May
Ascension Day:	40 days after Easter/varied
Pentecost:	May (Whit Monday)
German Unity Day:	3 October
Reformation Day:	31 October

Orientation for people interested in studying at the UAS Jena:

University Information Day:	April of every year
Trial study days:	April of every year
Girl's Day:	March/April of every year
Introductory days for first semester students:	at the beginning of the winter semester
Orientation for secondary school classes:	by appointment with the Advisors on Study Courses (see: Important contacts)

I.1.2 Important addresses

Note: For current office hours, see the UAS Jena website (Internet: www.eah-jena.de), the current UAS Jena Study Guide or the information boards of the respective offices.

Department offices:
Each Department (in German: Fachbereich) has a general administration office (in German: Sekretariat).

Business Administration:	Phone: +49 (0)3641 205-550, bw@eah-jena.de
Electrical and Information Engineering:	Phone: +49 (0)3641 205-700, et@eah-jena.de
Fundamental Sciences:	Phone: +49 (0)3641 205-500, gw@eah-jena.de
Mechanical Engineering:	Phone: +49 (0)3641 205-300, mb@eah-jena.de
Medical Engineering and Biotechnology:	Phone: +49 (0)3641 205-600, mt@eah-jena.de
SciTec (Precision-Optics-Materials-Environment):	Phone: +49 (0)3641 205-400 Phone: +49 (0)3641 205-350, SciTec@eah-jena.de

Social Work:	Phone: +49 (0)3641 205-800, sw@eah-jena.de
Industrial Engineering:	Phone: +49 (0)3641 205-900, wi@eah-jena.de

Student Advisory Service

(in German: Zentrale Studienberatung)
Anja Jansen
Bldg. 1, ground floor, room 13 (01.00.13)
Phone: +49 (0)3641 205-122
Fax: +49 (0)3641 205-121
E-Mail: studienberatung@eah-jena.de

Student Information Centre
(your first drop-in centre for information)

(in German: Service Zentrum Studentische Angelegenheiten)
Uwe Scharlock
Bldg. 1, ground floor, room 10 (01.00.15)
Phone +49 (0)3641 205-230
Fax: +49 (0)3641 205-231
E-Mail: uwe.scharlock@eah-jena.de

Admission and Registrar's Office

(in German: Studentensekretariat)
Beate Thieme, Andrea Hendrich
Bldg. 1, ground floor, room 11 and 10 (01.00.10 and 01.00.11)
Phone: +49 (0)3641 205-232 and -233
Fax: +49 (0)3641 205-231
E-Mail: studentensekretariat@eah-jena.de

International Office:

(in German: Akademisches Auslandsamt)
Angelika Förster
Bldg. 1, ground floor, room 12 (01.00.12)
Phone: +49 (0)3641 205-135
Fax: +49 (0)3641 205-136
E-Mail: auslandsamt@eah-jena.de

Servicepoint Master:

Elvira Babic
Bldg. 1, ground floor, Raum 10 (01.00.10)
Phone: +49 (03641) 205-148
Fax: +49 (03641) 205-231
E-Mail: master@eah-jena.de

Career Service:

Franziska Stang
Bldg. 1 ground floor, room 09 (01.00.09)
Phone:. +49 (03641) 205-787
E-Mail: career-service@eah-jena.de

Thoska-Office:

Sabine Schubert
Bldg. 1, ground floor, room 17 (01.00.17)
Phone: +49 (03641) 205-266
Fax: +49 (03641) 205-231
E-Mail: thoska@eah-jena.de

Examination offices of the departments:
Each Department (in German: Fachbereich) has an examination office (in German: Prüfungsamt).

Business Administration and Mechanical Engineering:	Marion Zipfel Phone: +49 (0)3641 205-580 E-Mail: PA-I@eah-jena.de
Social Work:	Birgit Engmann Phone: +49 (0)3641 205-808 Fax: +49 (0) 3641 205-801 E-Mail: PA-II@eah-jena.de

Electrical Engineering/, Information Engineering, Medical Engineering and Biotechnology, SciTec:	Gudrun Maetzig Phone: +49 (0)3641 205-236 Fax: +49 (0)3641 205-235 E-Mail: PA-III@eah-jena.de
Industrial Engineering:	Kristina Sommerwerk Phone: +49 (0)3641 205-921 and -928 Fax: +49 (0) 3641 205-901 E-Mail: PA-IV@eah-jena.de

Work placement offices of the departments:
Each Department (in German: Fachbereich) has a work placement office (in German: Praktikantenamt).

All engineering courses:	Dr. Sabine Karthe Phone: +49 (0)3641 205-485 Fax: +49 (0) 3641 205-451 E-Mail: sabine.karthe@eah-jena.de
Social Work:	Judith Kunze Phone: +49 (0)3641 205-805 Fax: +49 (0) 3641 205-807 E-Mail: Judith.Kunze@eah-jena.de
Business Administration:	Gabriele Bliedtner Phone: +49 (0)3641 205-566 Fax: +49 (0)3641 205-567 E-Mail: gabriele.bliedtner@eah-jena.de
Industrial Engineering:	Kristina Sommerwerk Phone: +49 (0)3641 205-921 Fax: +49 (0) 3641 205-901 E-Mail: PA-IV@eah-jena.de
Academic sports officer:	(in German: Hochschulsport) Michael Rothe Bldg. 3, 1st floor, room 11 (03.00.11) Phone: +49 (0)3641 205-254 Fax: +49 (0)3641 205-251 E-Mail: hochschulsport@eah-jena.de Web: http://hochschulsport.eah-jena.de/

Library (in German: Bibliothek)**:**

lending service, enquiries, info:	Bldg. 5, ground floor, room 47 (05.00.47) Phone: +49 (0)3641 205-280 and -290 E-Mail: bibliothek@eah-jena.de Internet: http://www.eah-jena.de/bib

Appointments for the Patent Information and Patent Enquiry Offices and the university archives should be made via telephone. A **free-of-charge "inventor guidance service"** provided by Jena patent lawyers is held on the third Tuesday of every month in the UAS Jena library. For appointments, please call: +49 (0)3641 205-273 or -275.

I.2 Information on Bachelor and Master Degree programmes

I.2.1 What is ECTS?

In Bologna in 1999, 29 European countries signed what is known as the „Bologna Declaration“. The aim was the creation of an "European area of higher education" by 2010. To reach this goal, common academic quality standards have to be established throughout Europe. These standards primarily address

- the adoption of a two-tier system of easily readable and comparable degrees (**Bachelor, Master**),
- the establishment of a system of **modules and credits (ECTS Credits)**,
- promoting the mobility of students (**Diploma Supplement**) as well as of teaching and research staff,
- quality assurance in study and teaching (**evaluation and accreditation**).

One prerequisite for the establishment of a European area of higher education is the European Credit Transfer and Accumulation System (ECTS). This European system for the crediting, transfer and accumulation of students' academic achievements is helpful, for example, when a student switches to another university or – with regard to lifelong learning – when someone starts an additional course of study at home or abroad.

The ECTS system is based on three principles:

1. Information (about the courses attended and outcomes achieved),
2. Learning Agreement (arranged between the institution concerned and the student), and
3. Assignment of ECTS credits (to display the student's workload).

I.2.2 ECTS coordinators

For information about the ECTS, you may contact the Programme Coordinator (Associate Dean/ Studiendekan) or the Departmental Advisor (Studienfachberater) of your study course, or the head of the International Office.

I.2.3 Bachelor

Bachelor degree programmes represent the basic academic course of study and culminate in a university degree that qualifies the graduate to enter a profession. A Bachelor programme lasts three to four years and is designed to enable the student to apply scientific methods in the given key study area and systematically create a basis for subsequent entry into professional life. It also equips students with non-subject-specific knowledge and capabilities. Graduating from a Bachelor degree course is a prerequisite for admission to a Master degree programme.

I.2.4 Master

Master degree programmes are based on a previously completed course of study (e.g., Bachelor). They usually take one to two years and broaden and deepen the knowledge acquired in a Bachelor degree course. Master degree courses can be either “research-oriented” or “application-oriented”, or a combination of both. Furthermore a distinction between “consecutive” (depending on a constitutive Bachelor degree course) and “non-consecutive” Master degree programmes is possible. In addition to this “qualifying” Master degree courses will also be offered at universities. They require additional professional experience (one to five years). Independent scientific work and research under supervision are the focus of a Master degree course. A Master degree is required in order to start a PhD-programme.

I.2.5 Modules

Bachelor and Master degree programmes have a modular structure, they are unitised. The modular system refers to an organisational principle, according to which courses consist of clearly defined teaching and learning units, both in terms of content and time. Modules are the building blocks of a course or several courses of study.
A module is described in respect to quality (by way of a module description) and quantity (by way of ECTS credits). An examination is course-related and takes place at the end of the module. Students achieve specific qualifications (subject specific and non-subject specific knowledge) which combine to make up the overall qualification for a profession. In general a module takes place during the course of one semester, although in exceptional, well-grounded cases it may last for up to three semesters.

A module may take place in any of the given forms:

In a **lecture** a lecturer teaches a specific subject. Basically it is of a theoretical nature, and a discussion with the students is rarely possible.

In **seminars** the knowledge gained in a lecture is deepened, they are usually held among small groups. Students are required to take part in a dialogue. New subject matter on particular topics can be dealt with in seminars.

In a **practice session** the theoretical knowledge imparted in the lecture is reinforced with the aid of practical assignments. Students are required to participate actively in these units.

Laboratory practice sessions are periods of subject-specific practical training in a lab, workshop or computer pool. Special working methods are practised under authentic working conditions.

There are various ways of concluding a module:

The most common method of completing a module is a **written examination**. The duration of the exam varies from 60 to 180 minutes. The examination questions usually relate to the content of the relevant module only and must be answered within the given amount of time.

In **oral examinations** students must answer questions on the subject matter of the given module. The duration of the exams varies but is generally shorter than a written examination.

In addition to these, there are various **alternative examinations** in the form of written tests (generally 60 minutes long), presentations, assignments, seminar/term papers or reports.

I.2.6 ECTS credits

The competences acquired within a module (including subject-related knowledge as well as key general skills) are examined and rated in terms of both **grades (best: 1; lowest: 5)** and credit points (**ECTS credits**). ECTS credits are based on the workload, i.e. the time spent by an average student in successfully attending a module, including private study time. One ECTS credit stands for approximately 25-30 hours of work load.

Under the ECTS, 60 credits measure the work load of a full-time student in a complete academic year; accordingly, 30 credits are allocated for one semester, as a rule.

A student will get ECTS credits for any one module only after he or she has passed the examination for that module with a grade between 1 and 4 and thus proved to have achieved the required learning objectives. As grading systems vary greatly between European countries, problems of mutual recognition arise frequently. Therefore, an ECTS grading scale has been established in addition to national grades and ECTS credits. (For more information: „Ordnung zur Berechnung von ECTS-Graden an der Ernst-Abbe-Hochschule Jena“)

I.2.7 Diploma Supplement

Starting in 2005, all graduates from the UAS Jena receive a Diploma Supplement (DS) free of charge. This is a supplement to the Diploma degree certificate, in English and/or German, which provides a detailed description of the qualifications obtained during the degree programme and of the structure of the German higher education system. The DS is internationally harmonised and is aimed to facilitate the mutual recognition of qualifications across national borders.

I.2.8 Evaluation and accreditation

Quality assurance is a mandatory constituent of the new study programmes offered by institutions of higher education. Measures include (1) internal evaluation of the teaching sessions by the students, and (2) regular appraisal of the new study programmes by external accreditation agencies and awarding of a quality seal by the accreditation council.

I.3 The study programmes in the department of Electrical Engineering and Information Technology

I.3.1 Contact

For any specific questions on the degree programmes at the department of Electrical Engineering and Information Technology please contact:

Academic adviser	Dr.-Ing. Oliver Reimer Phone: +49 (0)3641 205-703 E-Mail: Oliver.Reimer@eah-jena.de
Head of course AE/IEi	Prof. Dr. Alexander Richter Phone: +49 (0) 3641 205 747 E-Mail: Alexander.Richter@eah-jena.de
Head of course EE/IE Specialisation AE	Prof. Dr. Jörg Müller Phone: +49 (0)3641 205-702 E-Mail: Joerg.Mueller@eah-jena.de
Head of course EE/IE Specialisation CMT	Prof. Dr. Jürgen Kampe Phone: +49 (0)3641 205-788 E-Mail: Juergen.Kampe@eah-jena.de
Head of course EE/IE Specialisation CE	Prof. Prof. Oliver Jack Phone: +49 (0)3641 205-715 E-Mail: Oliver.Jack@eah-jena.de
Head of course SD	Prof. Dr. Frank Giesecke Phone: +49 (0)3641 205-764 E-Mail: Frank.Giesecke@eah-jena.de
Head of course SE	Prof. Dr. Burkart Voß Phone: +49 (0)3641 205-731 E-Mail: Burkart.Voß@eah-jena.de
Head of course ME	Prof. Dr.-Ing. Jörg Müller Tel.: (03641) 205-702 E-Mail: Joerg.Mueller@eah-jena.de

I.3.2 Module descriptions

In this chapter all offered modules (classified by module number) are described in detail. You can find the respective module number in the following overviews.
The first overview shows the modules of the Combined Field of Basics for all four Bachelor Courses, separately listed the modules from 4th to 7th semester for the Bachelor Programme EE/IT with it's specialisations: Automation Engineering (AE), Communication and Media Technology (CMT), Computer Engineering (CE) and the Bachelor Programme Automation Engineering/Information Technology International (AE/IEi). At the end you will find the overview of module descriptions for the Master Programmes System Design (SD) and Space Electronics (SE).

Combined Field of Basics for all specialisations (1st – 3rd semester, all bachelor programmes):

Module-No.	Module name	Module part	Semester	Programme
ET.1.101	Mathmatics 1		1	EE/IT, AE/IEi
ET.1.102	Mathmatics 2		1	EE/IT, AE/IEi
ET.1.103	Electrical Engineering 1		1	EE/IT, AE/IEi
ET.1.104.1	Computer Engineering (ET.1.104)	Basic of programming	1	EE/IT, AE/IEi
ET.1.104.2		Algorithms and data structures	2	EE/IT, AE/IEi
ET.1.105.1	Physics (ET.1.105)		1	EE/IT, AE/IEi
ET.1.105.2			2	EE/IT, AE/IEi
ET.1.106.1	Technical English (ET.1.106)		1	EE/IT, AE/IEi
ET.1.106.2			2	EE/IT, AE/IEi
ET.1.202	Mathmatics 3		2	EE/IT, AE/IEi
ET.1.203	Electrical Engineering 2		2	EE/IT, AE/IEi
ET.1.201.1	Electronic Components (ET.1.201)		2	EE/IT, AE/IEi
ET.1.201.2			3	EE/IT, AE/IEi
ET.1.301	Circuit Design		3	EE/IT
ET.1.302	Theory of Signals and Systems (ET.1.302)		3	EE/IT, AE/IEi
ET.1.303.1	Basic Measurement Techniques (ET.1.303)		3	EE/IT, AE/IEi
ET.1.304	Automatic Control		3	EE/IT, AE/IEi
ET.1.305	Digital Systems		3	EE/IT, AE/IEi
ET.1.306.1	Intercultural Communication 1 (ET.1.306)	Elective module Foreign Languages	3	AE/IEi

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Bachelorprogramme Automation Engineering /Information Engineering International (4th – 7th Semester):

Module-No.	Module name	Module part	Semester	Programme
ET.1.306.2	Intercultural Communication 1 (ET.1.306)	Introduction to Intercultural Communication	4	AE/IEi
ET.1.411	Digital Signal Processing		4	AE/IEi
ET.1.303.2	Basic Measurement Techniques (ET.1.303)		4	AE/IEi
ET.1.401	Microprocessor Technology		4	AE/IEi
ET.1.402.3	Analogue Circuit Design		4	AE/IEi
ET.1.403	Digital Design		4	AE/IEi
ET.1.404	Electrical Drives		4	AE/IEi
ET.1.510	Intercultural Communication 2		5	AE/IEi
ET.1.511	Modules abroad		5	AE/IEi
ET.1.501	Non-technical Elective Module	To be announced	6	AE/IEi
ET.1.606	Intercultural Communication 3		6	AE/IEi
ET.1.601	Digital Control Systems		6	AE/IEi
ET.1.406.1	Image Processing		6	AE/IEi
ET.1.410	Software Engineering		6	AE/IEi
ET.1.900	Elective Modules		6	AE/IEi
ET.1.605	Microcomputer Design		6	AE/IEi
ET.1.907	Automation Objects		6	AE/IEi
ET.1.908	Selected Sections on Analogue Circuitry		6	AE/IEi
ET.1.407.1	Introduction in Optoelectronics		6	AE/IEi
ET.1.509.2	Real Time Operating Systems		6	AE/IEi
ET.1.701	Industrial Placement		7	AE/IEi
ET.1.702	Bachelor Thesis		7	AE/IEi
ET.1.703	Colloquium		7	AE/IEi

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Bachelorprogramme Electrical Engineering /Information Engineering (4th – 7th Semester)
- Specialisation Automation Engineering -

Module-No.	Module name	Module part	Semester	Programme
ET.1.411	Digital Signal Processing		4	EE/IE – Sp.: AE
ET.1.303.2	Basic Measurement Techniques (ET.1.303)		4	EE/IE – Sp.: AE
ET.1.401	Microprocessor Technology		4	EE/IE – Sp.: AE
ET.1.403	Digital Design		4	EE/IE – Sp.: AE
ET.1.404	Electrical Drives		4	EE/IE – Sp.: AE
ET.1.402.1	Analogue Circuit Design (ET.1.402)		4	EE/IE – Sp.: AE
ET.1.402.2			5	EE/IE – Sp.: AE
ET.1.405.1	Control Systems (ET.1.405)	Control Systems/ PLC	4	EE/IE – Sp.: AE
ET.1.405.2		Motion Control	5	EE/IE – Sp.: AE
ET.1.502	Modelling/Simulation		5	EE/IE – Sp.: AE
ET.1.503	Automation Systems		5	EE/IE – Sp.: AE
ET.1.504.1	Process Communication (ET.1.504)	Fieldbus	5	EE/IE – Sp.: AE
ET.1.504.2		Local Area Networks	6	EE/IE – Sp.: AE
ET.1.501	Non-Technical Elective Module		5/6	EE/IE – Sp.: AE
ET.1.501.1	Business Administration		5	EE/IE – Sp.: AE
ET.1.501.2	Management of Projects		6	EE/IE – Sp.: AE
ET.1.501.3	Working Environment in Future		5/6	EE/IE – Sp.: AE
ET.1.501.4	Planning Game Strat Up		5/6	EE/IE – Sp.: AE
ET.1.501.5	E-Business Innovation Startup Founding		5/6	EE/IE – Sp.: AE
ET.1.501.6	GM, Businessplaning I und II		5/6	EE/IE – Sp.: AE
ET.1.501.7	Innovationmanagement		5/6	EE/IE – Sp.: AE
ET.1.406.1	Image Processing/Image Analysis (ET.1.406)	Image Processing	6	EE/IE – Sp.: AE
ET.1.407	Optoelectronics		6	EE/IE – Sp.: AE
ET.1.601	Digital Control Systems		6	EE/IE – Sp.: AE
ET.1.900	Elective Modules		5 / 6	EE/IE – Sp.: AE
ET.1.901	Electromagnetic Compatibility		5 / 6	EE/IE – Sp.: AE
ET.1.902	Power Electronics		5 / 6	EE/IE – Sp.: AE
ET.1.903	Sensor Technology		5 / 6	EE/IE – Sp.: AE
ET.1.904	Integrated Circuit Design		5 / 6	EE/IE – Sp.: AE
ET.1.905	Process Measurement Technology		5 / 6	EE/IE – Sp.: AE
ET.1.907	Automation Objects		5 / 6	EE/IE – Sp.: AE
ET.1.908	Selected Sections on Analogue Circuitry		5 / 6	EE/IE – Sp.: AE
ET.1.701	Industrial Placement		7	EE/IE – Sp.: AE
ET.1.702	Bachelor Thesis		7	EE/IE – Sp.: AE
ET.1.703	Colloquium		7	EE/IE – Sp.: AE

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Bachelorprogramme Electrical Engineering /Information Engineering (4th – 7th Semester)
- Specialisation Communication and Media Technology-

Module-No.	Module name	Module part	Semester	Programme
ET.1.411	Digital Signal Processing		4	EE/IE – Sp.: CMT
ET.1.303.2	Basic Measurement Techniques (ET.1.303)		4	EE/IE – Sp.: CMT
ET.1.401	Microprocessor Technology		4	EE/IE – Sp.: CMT
ET.1.407	Optoelectronics		4	EE/IE – Sp.: CMT
ET.1.408	Introduction in Communication Engineering		4	EE/IE – Sp.: CMT
ET.1.402.1	Analogue Circuit Design (ET.1.402)		4	EE/IE – Sp.: CMT
ET.1.402.2			5	EE/IE – Sp.: CMT
ET.1.406.1	Image Processing/Image Analysis (ET.1.406)	Image Processing	4	EE/IE – Sp.: CMT
ET.1.406.2		Image Analysis	5	EE/IE – Sp.: CMT
ET.1.507	Communication Networks		5	EE/IE – Sp.: CMT
ET.1.505	Computer Graphics		5	EE/IE – Sp.: CMT
ET.1.506.1	Radio Frequency Technique (ET.1.506)		5	EE/IE – Sp.: CMT
ET.1.506.2			6	EE/IE – Sp.: CMT
ET.1.501	Non-Technical Elective Module		5/6	EE/IE – Sp.: CMT
ET.1.501.1	Business Admin.		5	EE/IE – Sp.: CMT
ET.1.501.2	Management of Projects		6	EE/IE – Sp.: CMT
ET.1.501.3	Working Environment in Future		5/6	EE/IE – Sp.: CMT
ET.1.501.4	Planning Game Strat Up		5/6	EE/IE – Sp.: CMT
ET.1.501.5	E-Business Innovation Startup Founding		5/6	EE/IE – Sp.: CMT
ET.1.501.6	GM, Businessplaning I und II		5/6	EE/IE – Sp.: CMT
ET.1.501.7	Innovationmanagement		5/6	EE/IE – Sp.: CMT
ET.1.602	Transmission Technique		6	EE/IE – Sp.: CMT
ET.1.603	Audio Engineering		6	EE/IE – Sp.: CMT
ET.1.604	Video Engineering		6	EE/IE – Sp.: CMT
ET.1.900	Elective Modules		5 / 6	EE/IE – Sp.: CMT
ET.1.901	Electromagnetic Compatibility		5 / 6	EE/IE – Sp.: CMT
ET.1.904	Integrated Circuit Design		5 / 6	EE/IE – Sp.: CMT
ET.1.906	Electronic Design		5 / 6	EE/IE – Sp.: CMT
ET.1.908	Selected Sections on Analogue Circuitry		5 / 6	EE/IE – Sp.: CMT
ET.1.909	Filter Design		5 / 6	EE/IE – Sp.: CMT
ET.1.910	Hardware Modelling		5 / 6	EE/IE – Sp.: CMT
ET.1.911	Web Design		5 / 6	EE/IE – Sp.: CMT
ET.1.403.1	Digital Design (Introduction)		5 / 6	EE/IE – Sp.: CMT
ET.1.912	Signal Processors		5 / 6	EE/IE – Sp.: CMT
ET.1.913	Multi-Med. Distributed Systems		5 / 6	EE/IE – Sp.: CMT
ET.1.701	Industrial Placement		7	EE/IE – Sp.: CMT
ET.1.702	Bachelor Thesis		7	EE/IE – Sp.: CMT
ET.1.703	Colloquium		7	EE/IE – Sp.: CMT

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Bachelor programme Electrical Engineering /Information Engineering (4th – 7th Semester)
- Specialisation Computer Engineering -

Module-No.	Module name	Module part	Semester	Programme
ET.1.302.2	Theory of Signals and Systems (ET.1.302)		4	EE/IE – Sp.: CE
ET.1.303.2	Basic Measurement Techniques (ET.1.303)		4	EE/IE – Sp.: CE
ET.1.401	Microprocessor Technology		4	EE/IE – Sp.: CE
ET.1.403	Digital Design		4	EE/IE – Sp.: CE
ET.1.409	Datenbase		4	EE/IE – Sp.: CE
ET.1.410	Software-Engineering		4	EE/IE – Sp.: CE
ET.1.402.1	Analogue Circuit Design (ET.1.402)		4	EE/IE – Sp.: CE
ET.1.402.2			5	EE/IE – Sp.: CE
ET.1.501	Non-Technical Elective Module		5/6	EE/IE – Sp.: CE
ET.1.501.1	Business Admin.		5	EE/IE – Sp.: CE
ET.1.501.2	Management of Projects		6	EE/IE – Sp.: CE
ET.1.501.3	Working Environment in Future		5/6	EE/IE – Sp.: CE
ET.1.501.4	Planning Game Strat Up		5/6	EE/IE – Sp.: CE
ET.1.501.5	E-Business Innovation Startup Founding		5/6	EE/IE – Sp.: CE
ET.1.501.6	GM, Businessplaning I und II		5/6	EE/IE – Sp.: CE
ET.1.501.7	Innovationmanagement		5/6	EE/IE – Sp.: CE
ET.1.508	Mobile Computing		5	EE/IE – Sp.: CE
ET.1.505	Computer Graphics		5	EE/IE – Sp.: CE
ET.1.504.1	Process Communication (ET.1.504)	Fieldbus	5	EE/IE – Sp.: CE
ET.1.504.2		LAN	6	EE/IE – Sp.: CE
ET.1.509.1	Operating Systems (ET.1.509)	Operating Systems	5	EE/IE – Sp.: CE
ET.1.509.2		Real-Time Operating Systems	6	EE/IE – Sp.: CE
ET.1.406.1	Image Processing		6	EE/IE – Sp.: CE
ET.1.605	Micro Computer Design		6	EE/IE – Sp.: CE
ET.1.900	Elective Modules		5 / 6	EE/IE – Sp.: CE
ET.1.901	Electromagnetic Compatibility		5 / 6	EE/IE – Sp.: CE
ET.1.904	Integrated Circuit Design		5 / 6	EE/IE – Sp.: CE
ET.1.906	Electronic Design		5 / 6	EE/IE – Sp.: CE
ET.1.908	Selected Sections on Analogue Circuitry		5 / 6	EE/IE – Sp.: CE
ET.1.909	Filter Design		5 / 6	EE/IE – Sp.: CE
ET.1.912	Signal Processors		5 / 6	EE/IE – Sp.: CE
ET.1.407.1	Optoelectronics (Introduction)		5 / 6	EE/IE – Sp.: CE
ET.1.601.1	Digital Control Systems (Introduction)		5 / 6	EE/IE – Sp.: CE
ET.1.701	Industrial Placement		7	EE/IE – Sp.: CE
ET.1.702	Bachelor Thesis		7	EE/IE – Sp.: CE
ET.1.703	Colloquium		7	EE/IE – Sp.: CE

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Master programme Electrical Engineering /Information Engineering

Module-No.	Module name	Module part			Semester	Programme
ET.2.106	Numerical Mathematics / Optimization				1	Ma EE/IE
ET.2.200	Design of Electronic Systems				2	Ma EE/IE
ET.2.202	Electromagnetic Fields				2	Ma EE/IE
ET.2.209	Technical elective modules*)				1/2	Ma EE/IE
ET.2.110	Nontechnical elective module**)				1	Ma EE/IE
ET.2.112		Industrial Property			1	Ma EE/IE
ET.2.113		English for Specific Purposes			1	Ma EE/IE
ET.2.114		Business Administration for Master Engineers			1	Ma EE/IE
ET.2.209	Technical elective modules:	linked Profil (AT, CMT, CE)				
ET.2.224	Intelligent Systems	x		x	2	Ma EE/IE
ET.2.211	Advanced Control Systems	x			2	Ma EE/IE
ET.2.120	Optimal Control	x			1	Ma EE/IE
ET.2.217	Technical Optics	x	x		1/2	Ma EE/IE
ET.2.215	Information Theory, Coding and Data Security		x		1/2	Ma EE/IE
ET.2.232	Augmented Reality/Virtual Reality		x	x	1/2	Ma EE/IE
ET.2.102	Softwareengineering		x	x	1/2	Ma EE/IE
ET.2.101	Theoretical Information Science			x	1/2	Ma EE/IE
ET.2.103	Digital Signal Processing	x	x	x	1	Ma EE/IE
ET.2.230	Processor Design			x	2	Ma EE/IE
ET.2.231	Signal Integrity		x		2	Ma EE/IE
ET.2.212	Embedded Systems	x	x	x	1/2	Ma EE/IE
ET.2.107	Servo Drive Systems and Components	x			1/2	Ma EE/IE
ET.2.220	Optoelectronics 2	x			2	Ma EE/IE
ET.2.218	Optical and optoelectronic sensors	x			2	Ma EE/IE
ET.2.221	Integration of mixed-signal circuits		x		2	Ma EE/IE
ET.2.219	Laser Technics	x	x		2	Ma EE/IE
ET.2.104	Reliability Theory	x	x	x	1	Ma EE/IE
ET.2.105	Analogue Design		x		1/2	Ma EE/IE
ET.2.300	Complex Lab Session				2/3	Ma ET/IT
ET.2.301	Master Thesis				3	Ma ET/IT
ET.2.302	Colloquium				3	Ma ET/IT

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Master programme Space Engineering

Module-No.	Module name	Module part	Semester	Programme
ET.2.103	Digital Signal Processing		1	SE
ET.2.104	Reliability Theory		1	SE
ET.2.120	Model Based Control Systems		1	SE
ET.2.121	Design of spaceborne electronics		1	SE
ET.2.122	Space Travel Systems		1	SE
ET.2.110	Nontechnical elective modules		1 / 2	SE
ET.2.112	Industrial Property		1	SE
ET.2.113	English for Specific Purposes		1	SE
ET.2.114	Business Administration for Master Engineers		1	SE
ET.2.200	Numerical Mathematics/Optimization		1	SE
ET.2.201	Satellite communication		2	SE
ET.2.202	Design of Electronic Systems		2	SE
ET.2.209	Technical elective modules		1 / 2	SE
ET.2.212	Embedded Systems		2	SE
ET.2.214	Actuators		2	SE
ET.2.218	Optoelectronics 2		2	SE
ET.2.220	Optical and optoelectronic sensors		2	SE
ET.2.224	Intelligent Systems		2	SE
ET.2.230	Processor Design		2	SE
ET.2.231	Signal Integrity		2	SE
ET.2.300	Complex Lab Session		2 / 3	SE
ET.2.301	Master Thesis		3	SE
ET.2.302	Colloquium		3	SE

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Master programme Mechatronics

Module-No.	Module name	Module part	Semester	Programme
ME.2.102	Mechatronics		1.	ME
ME.2.105	Pattern Recognition		1.	ME
ET.2.120	Optimal Control and Regulate		1.	ME
ET.2.211	Complex Controls		2.	ME
ET.2.200	Numerical Mathematics / Optimization		2.	ME
ME.2.203	00	Actuators Simulation of Electromechanical Systems	2.	ME
ME.2.109	Mechatronics Project		2./3.	ME
ME.2.107	Nontechnical elective module		1.	ME
ME.2.108	Technical elective modules		1./2.	ME
ET.2.112	Nontechnical elective module	Industrial Property	1.	ME
ET.2.113		English for Specific Purposes	1.	ME
ET.2.114		Business Administration for Master Engineers	1.	ME
ME.2.108	Technical elective modules			ME
ME.2.206	Experimental modal analysis		variabel	ME
ET.2.104	Reliability Theory		variabel	ME
ET.2.220	Optical and Optoelectronical Sensors		variabel	ME
ET.2.221	Integrated mixed signal circuits		variabel	ME
ET.2.224	Intelligent systems		variabel	ME
ET.2.231	signal integrity		variabel	ME
ET.2.232	Augmented Reality/Virtual Reality		variabel	ME
ET.2.212	Embedded Systems		variabel	ME
ET.2.202	Design of Electronic Systems		variabel	ME
ME.2.301	Masterarbeit		3.	ME
ME.2.302	Kolloquium		3.	ME

Legend for the module code: ET.Y.XXX.Z
ET = Department of EE/IT
Y = Module level (1= bachelor level, 2= master level)
XXX = basic module code
Z = Module part (necessary for modules with 2 semester duration, 1 = first part, 2 = second part)

Module number	**ET.1.101**
Module name	**Mathematics 1**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Elizabeth Ribe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful completion of this module, students are capable of… - solving equations and inequations (with fractions, powers, roots, absolute values, logarithms, summations and products) using elementary algebra rules. - specifying the solution set of equations and inequations as intervals or sets. - performing basic operations on vectors. - determine characteristics of vectors (magnitude, linear independence, parallelism, etc.). - calculate vector products (dot product, cross product, scalar triple product). - using vector products in order to determine characteristics of vectors (angle between vectors, parallelism, linear independence, etc.). - setting up various forms of equations for planes and lines. - examining the positions of points, lines, and planes to one another. - performing basic operations on matrices. - determining various characteristics of matrices (dimensions, type, rank, determinant, invertibility, etc.). - determining all solutions of a linear system of equations using Gaussian elimination. - determining all of a matrix's eigenvalues and eigenvectors. - switching between the rectangular, polar, and exponential forms of complex numbers. - identifying various characteristics of complex numbers (magnitude, argument, imaginary part, real part, complex conjugate). - performing calculations on complex numbers involving addition, multiplication, division, powers, and roots. - representing complex numbers in the Cartesian complex plane and Polar complex plane.
Module content	- Elemental Algebra - Vectors in the 2- and 3 dimensions - Linear equations - Matrices - Determinants and eigenvalue problem
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Exercises with solutions, worksheets
Recommended literature	- Papula: Mathematik für Ingenieure Bd. 1-3 - Papula , Mathematische Formelsammlung
Method(s) of instruction/ media being used	Lecture / Exercise
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	1st term
Recommended requirements	Entrance qualification for Universities of Applied Sciences
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 60 h presence time 120 h self study 45 h lectures 45 Exercises 30 h exam preperation
Usability of this module	Mathematics 3 Numerical Mathematics / Optimization
Time	According time table
Duration of module	1 term

Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.102**
Module name	**Mathematics 2**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Henning Kempka
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Confidence in dealing with methods of differential calculus and integration in one variable to solve practical problems. After succesfull participation at the module Mathematik 2 the students are able to apply the methods which are taught in the areas which are content of the module. Further, they posess the Abbility to sucessfully apply the mathematical procedures on physical and engineering problems.
Module content	Sequences and limits Series and Potential series Elementary Functions - Terms; general properties of functions of one variable - Exponential-, Logarithm- and trigonometric functions - Polynomials and rational functions Onedimensional differential calculus - Continuity of functions - Derivative and its properties, derivation rules - Applications of differential calculus (Taylor's formula, limits on the Bernoulli de l'Hospital, Newton's method) Integral Calculus - Definite and indefinite integral, fundamental theorem of differential and integral calculus - Integration rules; applications of the definite integral - Improper integral and the Gamma function
Course type	4L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Exercises with solutions, worksheets
Recommended literature	- Papula,Mathematik für Ingenieure und Naturwissenschaftler, Bd.1-3 - Papula , Mathematische Formelsammlung - Bartsch , Mathematische Formeln
Method(s) of instruction/ media being used	Lecture, supplemented by exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	1st term
Recommended requirements	Entrance qualification for Universities of Applied Sciences
Assessment	exam 120 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 90h of contact hours and 90h of self-study, consisting of: 70 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 20 h exam preparation
Usability of this module	Following modules: Mathematics 3 Numerical Mathematics / Optimization Stochastics
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.103**
Module name	**Electrical Engineering 1**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. Thomas Reuter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student should learn the fundamentals of Electrical Engineering especially direct current technique, as well as basic properties and characteristics of electrical and magnetic fields in different media.
Module content	- Base items of Electrical Engineering, basic circuit, branched and no branched electrical circuit, active and passive two terminal network - Voltage and power source, energy and power balance - calculation procedure of direct current networks - characterisation and calculation of electrical and magnetic fields, transients by switching operations
Course type	3L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	exercises, e-learning
Recommended literature	Führer u.a.: Grundlagen ET 1 + 2 Weißgerber: Elektrotechnik für Ingenieure Bd. 1 – 3 Vömel, Zastrow: Aufgabensammlung ET 1+2
Method(s) of instruction/ media being used	Lecture: work on the blackboard, tutorial exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	1st term
Compulsory requirements	none
Recommended requirements	Entrance qualification for Universities of Applied Sciences
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 90 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Requirement for Electrical Engineering 2
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.104.1**
Module name	**Computer Science**
Sub module	Computer Science Basics
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to understand algorithms and basic data structures - to remember the imperative programming paradigm - to identify recursive algorithms - to understand syntax and semantics of imperative proograms - to understand structured programming - to apply refinement for developing procedural programs in the programming language C
Module content	Information, message, data, problem - algorithm – program, imperative programming constructs, structurered programming, program semantics: control-flow diagram, basic data structures: strings and arrays, abstract data types, functionsand procedures: call-by-value and call-by-reference, recursion
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture slides, examples of solutions
Recommended literature	Joachim Goll und Cornelia Heinisch. Java als erste Programmiersprache: Ein professioneller Einstieg in die Objektorientierung mit Java.Springer Verlag, Berlin, 7. Auflage, 2013. Guido Krüger.Handbuch der Java Programmierung. O'Reilly Verlag, Köln, 8. Auflage, 2014. Dietmar Ratz, Jens Scheffler, Detlef Seese, und Jan Wiesenberger. Grundkurs Programmieren in Java, Band 1.Carl Hanser Verlag, München, 7. Auflage, 2014. Bernhard Steppan. Einstieg in Java 7.Galileo Press, Bonn, 4. Auflage, 2011.
Method(s) of instruction/ media being used	lecture, exercise course at the PC-Lab
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	1. term
Compulsory requirements	none
Assessment	term paper
Assessment modalities	SL - ungraded course work during the lecture period
Further Information	The students have to do a software programming task.
ECTS credits	9 (for the total modul)
Workload	135h of total work load, thereof 60h of contact hours and 75h of self-study, consisting of: 60 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Submodule Algorithms and data structures, Mobile Computing / Software-Engineering forMobile Systems,Operating Systems, Software Engineering, Real Time Operating Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.104.2**
Module name	**Computer Science**
Sub module	Algorithms and data structures
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to apply algorithms and data structures for basic problems - to understand specific algorithms and data structures for searching, sorting and graph problems - to analyse algorithms with respect to efficiency and correctness - to test programs systematically - to understand object-oriented programming - to apply object-oriented program develoment methods in C++
Module content	Basic algorithms and data structures,Interdependency between algorithms and data structure, proof of correctness, efficiency considerations, programming paradigms
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture slides, examples of solutions
Recommended literature	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, und Clifford Stein: Algorithmen - Eine Einführung, Oldenbourg 2010 Aho, A.V., Hopcroft, J.E., Ullman, J.D.: Data Structures and Algorithms, Addison-Wesley 1993 Sedgewick, R.: Algorithms in C, Addison Wesley 1990 Sedgewick, R.: Algorithmen in C++, Addison Wesley 2002
Method(s) of instruction/ media being used	lecture, exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	2. term
Compulsory requirements	none
Recommended requirements	Modul ET.1.104.1 - Grundlagen der Programmierung
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to conduct a software programming project
ECTS credits	9 (for the total modul)
Workload	135h of total work load, thereof 60h of contact hours and 75h of self-study, consisting of: 60 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Mobile Computing / Software-Engineering forMobile Systems,Operating Systems, Real-Time-Operating Systems, Software Engineering
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.105.1**
Module name	**Physics**
Sub module	Physics 1
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr. Stefan Sienz
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Consolidated and extended basic physical knowledge, modelling of physical problems and application to simple examples in mechanics, electrostatics and magnetostatics (abstraction, setting up and solving of equations, distinction of essential from negligible influences, interpretation of the results)
Module content	Kinematics, dynamics of point mass , rigid body dynamics, oscillation, fluid mechanics, electrostatics, magnetostatics
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Worksheets, exercises, e-learning
Recommended literature	D. C. Giancoli, Physik: Lehr- und Übungsbuch, Pearson Studium; 3. Auflage 2009 D. Halliday, R. Resnick, J Walker, Physik, Bachelor Edition Wiley-VCH, Weinheim 2007 Paul A Tipler, Gene Mosca Physik für Wissenschaftler und Ingenieure, Elsevier, 2. Aufl. 2004, ISBN 3-8274-1164-5 F. Kuypers, Physik für Ingenieure, Bd.1: Mechanik und Thermodynamik, VCH-Verlag Weinheim 2002 M. Alonso, E. Finn, Physics, Addison Wesley; Revised edition (June 10, 1992)
Method(s) of instruction/ media being used	Lecture with exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	1st term
Recommended requirements	Entrance qualification for Universities of Applied Sciences
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
Further Information	Successful participation and cooperation in excercises and if any e-learning
ECTS credits	9 (for the entire module)
Workload	135h of total work load, thereof 60h of contact hours and 75h of self-study, consisting of: 35 h lecture (preparation and rework) 25 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Measurement technology
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.105.2**
Module name	**Physics**
Sub module	Physics 2
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr. Stefan Sienz
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Extended basic physical knowledge, application to simple examples (recognition of analogies, distinction of essential from not essential influences, interpretation of the results), application of the knowledge in practical laboratory courses (consolidation of the knowledge, practice with measuring instruments, first experience in evaluation and valuation of measuring results)
Module content	Thermodynamics, waves, geometrical optics, wave optics, selected topics of quantum physics, among others the wave-particle dualism
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Worksheets, exercises, E-learning
Recommended literature	D. C. Giancoli, Physik: Lehr- und Übungsbuch, Pearson Studium; 3. Auflage 2009 D. Halliday, R. Resnick, J Walker, Physik, Bachelor Edition Wiley-VCH, Weinheim 2007 Paul A Tipler, Gene Mosca Physik für Wissenschaftler und Ingenieure, Elsevier, 2. Aufl. 2004, ISBN 3-8274-1164-5 F. Kuypers, Physik für Ingenieure, Bd.1: Mechanik und Thermodynamik, VCH-Verlag Weinheim 2002 M. Alonso, E. Finn, Physics, Addison Wesley; Revised edition (June 10, 1992)
Method(s) of instruction/ media being used	Lecture with exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	2nd term
Compulsory requirements	none
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
Further Information	Successful participation and cooperation in excercises and if any e-learning
ECTS credits	9 (for the entire module)
Workload	135h of total work load, thereof 60h of contact hours and 75h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h excercise courses 15 h practical training (preparation and evaluation) 15 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.106**
Module name	**Technical English**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Frau Wiedemann
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Students are enabled to deal with a wide variety of study and work-related situations in English (Level B2 of the Common European Framework). At the same time, students consolidate and extend their existing language skills as well as general vocabulary and grammar.
Module content	- studying at the UAS Jena - basic mathematics and describing graphs - IT, technical devices and measuring instruments - lab sessions - materials, energy, electricity - projects and presentations
Course type	0L - 2E - 0S - 0P (ET.1.106.1) 0L - 3E - 0S - 0P (ET.1.106.2) (Lecture, Exercises, Seminar, practical course)
Learning Material	script and handouts
Recommended literature	- Comfort,Hick, Savage „Basic Technical English“ Oxford University Press, 1990 - Wagner” Science and Engineering” Cornelsen & Oxford, 2000 - AGlendinning , McEwan” Oxford English for Electronics”, Oxford University Press,1993 - Bauer “English for technical purposes” Cornelsen & Oxford, 2000 - Englisch für technische Berufe – Computer und IT-Berufe, Klett-Verlag 2002 - Encyclopaedia Britannica, CD-ROM editino, 1997 - Murphy “English Grammar in Use” CUP/ Klett-Verlag - Wagner, Zörner „Technical Grammar and Vocabulary”, Cornelsen& Oxford, 1998 - Vince, Michael, Macmillan English Grammar in Context -Zeitschrift: “Inch” (Technical English Inch by Inch) -Cambridge English for Engineering. CPU 2012 -Cambridge English for Scientists. CPU 2012
Method(s) of instruction/ media being used	Multimedia, Video, Audio materials
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winterterm and summer term
Term	1st and 2nd term
Recommended requirements	Above level B1 of Common European Framework of Reference for Languages
Assessment	course attendance certificate, written test
Assessment modalities	SL - ungraded course work during the lecture period
Further Information	MODULE ACHIEVEMENT after 1st Semester written examination (90 minutes) in 2nd Semester
ECTS credits	6 (for the entire module)
Workload	180 h of total work load, therefrom 75 of presence at university and 105 h of self-study, consisting of: - 80 h seminar (preparation and rework) - 25 h preparation for examination
Usability of this module	Creditable for other Modules of Technical English within the Bachelor studies at the University of Applied Sciences Jena, equivalent to level B2 CEF or Unicert II technical language
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	English

Module number	**ET.1.201**
Module name	**Prof. Dr. Martin Hoffmann**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Martin Hoffmann
Compulsory/ optional/ electiv	Compulsory
Learning objectives	- Basic knowledge about function, construction and application of electronic components - Practical experience in measurement of parameters of electronic components - Standard applications in electronic cirquits - Definition of Parameters for electronic devices in applications and selection of devices by data sheets
Module content	Passive components R,L,C, semiconductor diodes, bipolar transistors, unipolar transistors, thyristors, optoelectronic devices
Course type	2. Term 3L – 0E – 0S – 1P (ET.1.201.1) 3. Term 1L – 0E – 0S – 1P (ET.1.201.2) (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lab instruction sheets, handouts
Recommended literature	Passive elektronische Bauelemente - Aufbau, Funktion, Eigenschaften, Dimensionierung und Anwendung, Leonhard Stiny, Verlag Springer Vieweg Aktive elektronische Bauelemente - Aufbau, Struktur, Wirkungsweise, Eigenschaften und praktischer Einsatz diskreter und integrierter Halbleiter-Bauteile, Leonhard Stiny, Verlag Springer Vieweg Werkstoffe und Bauelemente der Elektrotechnik, Hanno Schaumburg, Verlag Teubner
Method(s) of instruction/ media being used	Lecture, practical course, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	Summer term- / winter term
Term	2. and 3. term
Compulsory requirements	none
Recommended requirements	Electrical Engineering 1, Analysis 1, Physik
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	9
Workload	270h (SWS) of total work load, thereof 90h of contact hours and 180h of self-study, consisting of: 80 h lecture (preparation and rework) 70 h practical training (preparation and evaluation) 30 h exam preparation
Usability of this module	Analog and Digital Circuit Organisation, Basic Measurement Techniques, Audio Engineering, Electronic Design
Time	According time table
Duration of module	2 terms
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.202**
Module name	**Mathematics 3**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Henning Kempka
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Confidence in dealing with methods of differential calculus and integration in several variables, in ordinary differential equations as well as in Laplace – and Fourier transform to solve practical problems. After succesfull participation at the module Mathematik 3 the students are able to apply the methods which are taught in the areas which are content of the module. Further, they posess the Abbility to sucessfully apply the mathematical procedures on physical and engineering problems. Furthermore, the students know the fundamental concepts of stochastics.
Module content	Multidimensional differential calculus - Functions of several variables - partial derivative and extremal values Multidimensional integral calculus - 2D-integrals in cartesian and polar coordinates - 3D-integrals in cartesian, zylinder- and spherical coordinates - Applications - line integrals, line parametrization Integral transforms - Fourier transform - Laplace transform Ordinary Differential Equations - Introduction, basic concepts, equations 1st order - Linear Differential Equations of 2nd (and higher) order with constant coefficients - Systems of linear Differential Equations of 1st order with constant Coefficients Stochastics - Basic concept of descritive Statistics - Correlation - Regression - Normal distribution A glimpse on Statistical inference
Course type	4L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Exercises with solutions, worksheets
Recommended literature	Papula, Mathematik für Ingenieure und Naturwissenschaftler, Bd. 1-3 Preuß/Wenisch, Lehr- und Übungsbuch Mathematik, Bd. 1-2 Papula, Mathematische Formelsammlung Bartsch, Mathematische Formeln Hartung, Elpelt, Klösener: Statistik, Lehr- und Handbuch der angewandten Statistik, DeGruyter (2012)
Method(s) of instruction/ media being used	Lecture, supplemented by exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	2nd term
Recommended requirements	Mathematics 1 and Mathematics 2
Assessment	exam 120 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 90h of contact hours and 90h of self-study, consisting of: 70 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 20 h exam preparation
Usability of this module	Numerical Mathematics / Optimization

Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.203**
Module name	**Electrical Engineering 2**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The basics of alternating current technology are to be taught. After successful participation, students are able to calculate different characteristics (effective value etc.) of alternating and mixed signals (signal shapes). Students can display sine sizes using pointers and perform calculations at the complex level. You are aware the relationships of power and can be applied. Students get to know to draw local curves and understand the three-phase system
Module content	The topics of the lecture are: description of sinusoidal and non-sinusoidal alternating variables - network calculation for alternating currents– symbolic method – phasor diagrams – transfer locus'– energy – power – three-phase systems
Course type	2L - 2E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	exercises, lab instruction sheets
Recommended literature	Führer u.a.: Grundlagen ET 1 + 2 Weißgerber: Elektrotechnik für Ingenieure Bd. 1 - 3 Vömel, Zastrow: Aufgabensammlung ET 1+2 Hagmann: Grundlagen der Elektrotechnik, Aufgabensammlung zu den Grundlagen der Elektrotechnik
Method(s) of instruction/ media being used	Lecture: work on blackboard, tutorial exercises, experiments in the laboratory after instructions and written preparations
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	2. term
Compulsory requirements	none
Recommended requirements	Elektrotechnik 1
Assessment	exam 90 min, laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180 h of total work load, thereof - 90 h of contact hours - 90 h of self-study, consisting of: preparation and rework lecture 20 h exercise 20 h practical training 30 h (preparation and evaluation) exam preparation 20 h
Usability of this module	Basis for all further ET-Moduls
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.301**
Module name	**Circuit Design**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr. Detlef Redlich
Compulsory/ optional/ electiv	Compulsory
Learning objectives	acquiring fundamental knowledge of design, function and application of electronic components and units including hands-on experience
Module content	- Design and properties, parameters and thresholds, typical application of components, diodes, bipolar and unipolar transistors, field effect transistors, thyristors, optoelectronic - Simulation of electronic circuits of digital and analogue technology
Course type	1L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	List will be announced during the lecture.
Recommended literature	B. Beetz: Elektroniksimulation mit PSpice. Vieweg-Verlag 2010
Method(s) of instruction/ media being used	lecture, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3. term
Compulsory requirements	none
Recommended requirements	Modules: Electronic Components, Electrical Engineering 1
Assessment	course attendance certificate
Assessment modalities	SL - ungraded course work during the lecture period
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 15 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Design of electronic systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.302**
Module name	**Theory of Signals and Systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Learning of methods for analysis of signals and systems for use in specification and test of modern communication systems and the development of solutions in automation.
Module content	Standard signals – classification of signals - characterization of signals by means of statistics – properties of systems - characterization of systems – convolution – Fourier transform – Laplace transform – sampling theorem – correlation
Course type	4L – 2E – 0S – 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture scripts, textbooks, tasks and solutions
Recommended literature	Frey, T.; Bossert, M.: Signal- und Systemtheorie Kreß, D.; Irmer, R.: Angewandte Systemtheorie Meyer, M.: Grundlagen der Informationstechnik
Method(s) of instruction/ media being used	lectures, exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3. term
Compulsory requirements	none
Recommended requirements	Mathematics, Basics of Electrical Engineering, Basics of Computer Science
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180 h of total work load, thereof - 90 h of contact hours - 90 h of self-study, consisting of: preparation and rework lecture 30 h exercise 30h exam preparation 30 h
Usability of this module	Usable for modules mainly related to processing of signals, for instance control engineering, measurement technology, audio and video processing, communication technology, computer sciences and signal processors. Furthermore this module is used for the course of studies in mechatronics
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.303**
Module name	**Basic Measurement Techniques**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful participation, the student is able to - define fundamentals of measurement (general definitions, standards, International System of Units) - derive uncertainties in measurement - characterize and parameters of measurement devices - know electromechanical measurement devices - introduce Digital Measurement - handle oscilloscopes - measure electrical quantities (I, U, R, Z, f, t) - measure circuit parameters - measure in Time Domain and in Frequency Domain (FFT Analyser, Spectrum Analyser, Network Analysis) - define signals and noise, Signal-to-Noise-Ratio, Noise figure - solve simlpe tasks in sensoric of non-electrical quantities by electrical means (displacement, position, angle, thickness of layers, force, pressure, temperature, material and gas humidity, vibration)
Module content	- fundamentals of measurement (general definitions, standards, International System of Units) - expression of uncertainties in measurement - characteristics and parameters of measurement devices - electromechanical measurement devices - introduction to Digital Measurement - measurement of electrical quantities (I, U) - oscilloscopes - measurement of electrical quantities (I, U, R, Z, f, t) - measurement of circuit parameters - measurement in Time Domain and in Frequency Domain (FFT Analyser, Spectrum Analyser, Network Analysis) - signals and noise, Signal-to-Noise-Ratio, Noise figure - expression of uncertainties in measurement (advanced level, correlated signals) - measurement of non-electrical quantities by electrical means (displacement, position, angle, thickness of layers, force, pressure, temperature, material and gas humidity, vibration)
Course type	3th Term: 2L – 1E – 0S – 1P (ET.1.303.1) 4th Term: 2L – 1E – 0S – 1P (ET.1.303.2) (Lecture, Exercises, Seminar, practical course)
Learning Material	Script, worksheets, lab instruction sheets
Recommended literature	Tränkler, R, „Taschenbuch der Messtechnik“, Oldenbourg, 1996 Schrüfer, E, „Elektronische Messtechnik“, Hanser, 2007 Mühl, T.: „Einführung in die elektrische Messtechnik“, Teubner, 2001 Partier, R, „Messtechnik“, Vieweg, 2001 Adunka, F, „ Messunsicherheiten, Vulkan, 1998 DIN V ENV 13005: „Leitfaden Angabe der Unsicherheit beim Messen“, 1999
Method(s) of instruction/ media being used	Lecture, theoretical exercises, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term and summer term
Term	3th and 4th term
Compulsory requirements	none
Recommended requirements	Mathematics, Physics, Electrical Engineering
Assessment	exam 120 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
Further Information	The module examination consists of a written test at the end of the 4th semester. In the test, students create solutuions for selected metrological

	questions, and calculate various technically relevant variables and para meters based on given practical examples.
ECTS credits	9
Workload	270 h
Time	According time table
Duration of module	2 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.304**
Module name	**Automatic Control**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATiTi (Ba)
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Students will be enabled to analyze and evaluate simple control loop structures.
Module content	- Description of the system by means of differential equations and transfer function - PID controller and derivatives - linear transfer elements - investigation of stability, vibration capability and control error of control systems
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, collection of tasks, lab instruction sheets
Recommended literature	Reuter, M.; Zacher, S.: Regelungstechnik für Ingenieure, F.Vieweg-Verlag, 10. Auflage, Braunschweig/Wiesbaden, 2002 Wendt, L.: Taschenbuch der Regelungstechnik, Verlag Harri Deutsch, 3. Auflage, Thun/ Frankfurt 2000
Method(s) of instruction/ media being used	lab instruction sheets and collection of tasks on the Internet; CAE- Software
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3. term
Compulsory requirements	-linear differential equations - calculate with complex numbers -matrix calculus -Laplace transform -partial fraction decomposition
Recommended requirements	none
Assessment	written university exam 90 min
Assessment modalities	PL – during period of exams (graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 70 h lecture (preparation and rework) 25 h practical training (preparation and evaluation) 25 h exam preparation
Usability of this module	- Modelling/ Simulation - Digital Control Systems - optimal control theory
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.305**
Module name	**Digital Systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able to understand the main digital signal codings. The students remember mathematical and formal forms of description as well as gate-level implementations of Boolean functions, they are able to apply the laws of Boolean algebra and Boolean algebra Rules as well as gate level minimization techniques, and they are able to design, build (assemble) and analyse basic as well as specific combinatorical circuits of computer science, measurement and automation technology. The students remember different forms of behavioral description and main models for finite state machines, and they are able to verify formal properties. The students remember several approaches of FSM state encoding, and they are able to design synchonouse and asynchronous automata, to assemble them of basic elements, and to analyse there behaviour. The students remember sources of dynamic errors in logic gate and in sequential circuits, and the students are able to apply principles to avoid them.
Module content	- Binary signals, signal coding, number systems, Boolean algebra; - truth table, basic functions / fundamental systems; - Boolean equations, logic minimization by equation transformation, Karnaugh-diagram, Quine-McCluskey, and K-diagram based factorization; logic synthesis and analysis; - kombinatorical main functions for data processing purposes; - sequential basic circuits and flip flops; - register, counter, finite state machines (FSM), there properties, modeling by state diagrams, models for Mealy and Moore automata and the conversation into one another, synthesis and verification of synchronous and asynchronous FSM; - dynamic behaviour of gate logic and automata; - practical exercise on the design of gate logic and automata, including keyboard controller, variable frequency signal generator, and pulse width modulator.
Course type	2L - 0E - 1S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture notes, exercises, lab instruction sheets
Recommended literature	K. Fricke: Digitaltechnik. Vieweg 2001 K. Urbanski, R.Woitowitz: Digitaltechnik; Ein Lehr- und Übungs-buch. Springer 2000 A.E.A. Almaini: Kombinatorische und sequentielle Schalt¬systeme. VCH 1989 G. Scarbata: Synthese und Analyse Digitaler Schaltungen H.-D. Wuttke, K. Henke: Schaltsysteme: Eine Automaten-theoretische Einführung. Pearson Studium 2003
Method(s) of instruction/ media being used	Lecture notes, exercises, lab instruction sheets
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3. term
Compulsory requirements	none
Assessment	exam 120 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
Further Information	The exam take place at the end of the 3rd semester. Regardless of the exam, the laboratory internship must be completed successfully.
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 45 h lecture (preparation and rework)

	25 h practical training (preparation and evaluation) 25 h exam preparation
Usability of this module	Digital Design, Information Technology, Microprocessor Technology, Embedded Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.306.1**
Module name	**Intercultural Communication 1**
Sub module	Elective Module Foreign language
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	See module description.
Module content	The elective module (3 ECTS credits) offers a selection of different courses. - English for Specific Purposes (ET.2.213) - French - Russian - Spanish - Chinese For more detailed information consult the module descriptions.
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3th term
Compulsory requirements	none
Assessment	see module description of optional module
Assessment modalities	see module description of optional module
ECTS credits	3
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.306.2**
Module name	**Intercultural Communication 1**
Sub module	Introduction in intercultural Communication
Department	Business Administration
Degree program	ATITi (Ba)
Module coordinator	Prof. Dr. Heiko Haase (FB BW)
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students are familiar with specific behaviorsin terms of businesscommunication and etiquettein majorcultural regions of theworld. As a result, they have the necessary intercultural skillsin order to successfully conduct business in different economic regions.
Module content	- Communicationconceptand models - oncept of cultureandcultural models - Interpersonal Communication - Cross-culturalstudiesofHofstede - Cross-culturalstudiesofHall - Cross-culturalstudiesofTrompenaars - Process ofcultural adaptation
Course type	2L - 0E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture notes, exercises andworksheets, recommended textbooks
Recommended literature	Schugk, Michael: Interkulturelle Kommunikation - Kulturbedingte Unterschiede in Verkauf und Werbung, Verlag Vahlen 2004. Heringer, Hans Jürgen: Interkulturelle Kommunikation: Grundlagen und Konzepte, UTB Verlag, 4. Auflage, 2014 Bolten, Jürgen: Einführung in die Interkulturelle Wirtschaftskommunikation, UTB Verlag 2007.
Method(s) of instruction/ media being used	Interactive lecture with theoretical model developments and case studies in international business practice
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4th term
Compulsory requirements	none
Assessment	term paper, case Study, presentation
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 40 h lecture (preparation and rework) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.306.3**
Module name	**English for Specific Purposes**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma), RFE (Ma), Me (Ma)
Module coordinator	Dr. Dagmar Berndt
Compulsory/ optional/ electiv	optional
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	1 (Bachelor=1, Master=2)
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	English

Module number	**ET.1.306.4**
Module name	**French**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Frau Wiedemann
Compulsory/ optional/ electiv	optional
Learning objectives	Students will be enabled to apply the French language in everyday and in occupational situations. They use the language receptively when reading and listening and productively when speaking and writing. The desired level is A1-A2 of the Common European framework, i.e. -understanding simple written or spoken texts with their relevant content and some details when reading or listening; -speaking or writing in personal everyday situations such as family, leisure, university issues, or welcoming guests, orientation in an unknown city, telephoning.
Module content	Based on the target of language learning focus is on reading, writing, listening and speaking in the example situations as listed: - Everyday situations - Leisure - Student life - Simple descriptions To improve listening comprehension audio and video material is frequently applied providing an insight into French-speakingcountries and making students aware of intercultural issues. Students acquire basic vocabulary and knowledge of elementary grammar in order to communicate effectively.
Course type	0L - 3E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	course material, course books, dictionaries
Recommended literature	Voyages 1 bzw.2 Klett Verlag
Method(s) of instruction/ media being used	communicative language instruction
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3th term
Compulsory requirements	none
Assessment	written test, presentation
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h exam preparation
Usability of this module	semester abroad
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German/ French

Module number	**ET.1.306.5**
Module name	**Spanish**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Dr. Dagmar Berndt
Compulsory/ optional/ electiv	optional
Learning objectives	Students will be enabled to apply the French language in everyday and in occupational situations. They use the language receptively when reading and listening and productively when speaking and writing. The desired level is A1-A2 of the Common European framework, i.e. - understanding simple written or spoken texts with their relevant content and some details when reading or listening; - speaking or writing in personal everyday situations such as family, leisure, university issues, or welcoming guests, orientation in an unknown city, telephoning.
Module content	Based on the target of language learning focus is on reading, writing, listening and speaking in the example situations as listed: - Everyday situations - Leisure - Student life - Simple descriptions To improve listening comprehension audio and video material is frequently applied providing an insight into French-speakingcountries and making students aware of intercultural issues. Students acquire basic vocabulary and knowledge of elementary grammar in order to communicate effectively.
Course type	0L - 3E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	scripts, dictionaries and course book
Recommended literature	„Universo.ele – A1“/ „Eñe – Ein Spanischbuch für Anfänger“ - Hueber-Verlag
Method(s) of instruction/ media being used	scripts, dictionaries and course book
Level/ category	(Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3. term
Compulsory requirements	Regular attendance is required
Recommended requirements	none or basic knowledge
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	Regular attendance at the courses is required!
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h exam preparation
Usability of this module	semester abroad
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German/ Spanish

Module number	**ET.1.306.6**
Module name	**Russian**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Herr Ulrich Schuhknecht
Compulsory/ optional/ electiv	optional
Learning objectives	Students will be enabled to apply the French language in everyday and in occupational situations. They use the language receptively when reading and listening and productively when speaking and writing. The desired level is A1-A2 of the Common European framework, i.e. - understanding simple written or spoken texts with their relevant content and some details when reading or listening; - speaking or writing in personal everyday situations such as family, leisure, university issues, or welcoming guests, orientation in an unknown city, telephoning.
Module content	Based on the target of language learning focus is on reading, writing, listening and speaking in the example situations as listed: - Everyday situations - Leisure - Student life - Simple descriptions To improve listening comprehension audio and video material is frequently applied providing an insight into French-speakingcountries and making students aware of intercultural issues. Students acquire basic vocabulary and knowledge of elementary grammar in order to communicate effectively.
Course type	0L - 3E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	course material, dictionaries
Method(s) of instruction/ media being used	communicative language instruction
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study.
Usability of this module	semester abroad
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German/ Russian

Module number	**ET.1.306.7**
Module name	**Chinese**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Dr. Joachim Boldt
Compulsory/ optional/ electiv	optional
Learning objectives	Beginnings of the Chinese standard language according to level A1 GER, that means simple oral and written communication
Module content	The course is designed on the following learning objectives: Greet, ask after the health; perform a simple small talk about the weather; to thank; say goodbye; make simple times, to make an appointment for the following day, ask for the name; greet someone after a long time, introduce yourself and others; somewhat negate decided; ask about the meaning of a word; initiate questions politely; Numbers to 10,000; ask for prices and negotiate; ask for the exchange rate, say what you want to buy, ask for repetition of what is said; exchange money; typical souvenirs shopping, make measurements, make assumptions, ask someone politely to something; ask for the total price; specify ownership and affiliations; determine objects closer. There are to acquire about 190 characters.
Course type	0L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Listening exercises, handouts, whiteboard notes
Recommended literature	Liao Liao - Das Chinesisch-Lehrwerk für den Kursunterricht in der Erwachsenenbildung. Kursbuch und Arbeitsbuch. Hueber Verlag; Autorin Thekla Chabbi
Method(s) of instruction/ media being used	Practical lessons / Multimedia
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	3th term
Recommended requirements	none or basic knowledge
Assessment	oral exam, written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study
Usability of this module	semester abroad
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German/ Chinese

Module number	**ET.1.401**
Module name	**Microprocessor Technology**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful completion of the module the students are able to: - understand the working principles and application potential of microcontrollers. - apply the datasheet as a main source of information needed to use the microcontroller - program microcontrollers in C - debug microcontroller based systems in a systematic way.
Module content	- General design of freely programmable hardware - Abstraction onto a programming model - General design of peripheral modules - general method of accessing peripheral modules via software - Programming procedure in C
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	datasheet, examples of solutions, tutorials for development tools
Recommended literature	Hennessy, J.L.; Patterson, D.A.: „Computer architecture: a quantitative approach“, Morgan Kaufmann, 2002 Schmitt, G.: „Mikrocomputertechnik mit Controllern der Atmel AVR-RISC-Familie“, Oldenburg, 2007 Clements, Alan: The principles of computer hardware, Oxford University Press, 2000
Method(s) of instruction/ media being used	Lecture, labs, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4th semester
Compulsory requirements	Basic programming skills, basics of digital circuit design
Assessment	course attendance certificate
Assessment modalities	SL - ungraded course work during the lecture period
Further Information	The skills in using microcontrollers are proven with the successful completion of a team project. The success of the project is demonstrated in the frame of a robot competition. The inividual ability to use microcontrollers successfully is proven in an interview
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 45 h lecture (preparation and rework) 50 h practical training (preparation and evaluation) 25 h exam preparation
Usability of this module	Real Time Operating Systems, Microcomputer Design, Digital Signal Processors, Processor Design
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.402**
Module name	**Analog Circuit Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. Thomas Reuter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student should familiarise with fundamentals of analog circuit organisation and get to know possible applications of operational amplifiers. The main aim if the knowledge of methods for circuit analysis and synthesis.
Module content	- differential amplifier, characteristics and properties of operational amplifiers - inverting / not-inverting amplifiers, current-to-voltage converter - transimpedance amplifier, computational circuits, constant sources - comparator, Schmitt-trigger
Course type	4. Term 2L – 2E – 0S – 0P (ET.1.402.1) ET/IT 5. Term 0L – 0E – 0S – 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	exercises, lab instruction sheets
Recommended literature	Tietze. U.; Schenk. C.: Halbleiterschaltungstechnik Bystron/Borgmeyer: Grundlagen der technischen Elektronik Morgenstern, B: Elektronik, Band II: Schaltungen
Method(s) of instruction/ media being used	Lecture: work on the blackboard Tutorial exercises experiments at the laboratory after instruction with written preparations
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	Sommer- /Wintersemester
Term	4. und 5. Semester
Compulsory requirements	none
Recommended requirements	4. und 5. Semester
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
Further Information	The exam takes place at the end of the 5th semester.
ECTS credits	6
Workload	180h of total work load, thereof 90h of contact hours and 90h of self-study, consisting of: 45 h lecture (preparation and rework) 30 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Integrated Circuits, Integration of mixed-signal circuits (SD Master), Analog Design (SD Master), Usage of module in other study courses: BMT, PT, ME
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.403**
Module name	**Digitaldesign**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	AT, TI
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The Student will be enabled to systematically design digital systems from the requirements analysis, the design, the simulation of the timing analysis to the implementation of complex functions in complex programmable circuits. Besides getting to know the design strategies the practical conversion for the design of a programmable SoC with a Hardware description language is emphasized. At the end of the module students know different design methodologies and are able to apply them in a given application context. The students know general methods of implementation for digital systems and they are able to evaluate their practicability. The students understand the design phases on different levels of abstraction and are able to establish appropriate design models. The students are able to apply basic synthesis approaches (such as, for example, high-level synthesis, scheduling and allocation, hierarchical decomposition, data- and control-path extraction, signal transition diagram and reachablitiy graph based synthesis of communication protocols, as well as ROBDD based logic synthesis) and ROBDD based verification approaches. At the end of the hands-on training students are able to design an application system on a FPGA development board, to create the behavioural specification and the architecture for the implementation, and to use the appropriate design tools.
Module content	- Systematic design methodology for application specific integrated systems (levels of abstraction on the basis of the Y-diagram, synthesis types, basic design flow for the top-down synthesis of digital systems); - means of implementation for digital systems (programmable devices, application specific devices); - hardware description languages, background information and history, basic concepts of HDL-based simulation, synthesis and verification (signals and variables, time modeling concept and delta cycles, test benches, formal verification); - hardware description language VHDL, coding examples, special modeling techniques such as counters, utilization of RAM-Structures, finite state machine with data path (FSMD), process model graph (PMG), communication between synchronous and asynchronous FSMs, modeling on different levels of abstraction; - differences and similarities of VHDL, Verilog and SystemC; - practical exercise on the VHDL-based design of an individually defined application on an FPGA evaluation board.
Course type	2L - 0E - 1S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture notes, exercises, lab instructions, examples
Recommended literature	D. Gajski et al.: Specifications and Design of Embedded Systems. AddisonWesley, 1994 D. Gajski et al.: High-Level-Synthesis: Introduction to Chip and System Design. Kluwer Academic Publishers, 1992 G. Herrmann, D.Müller: ASIC - Entwurf und Test. Fachbuchverlag Leipzig, 2004 F. Rammig: Systematischer Entwurf digitaler Systeme. B.G. Teubner, 1989 T. Kropf: VLSI-Entwurf. Vorgehen, Methoden, Automatisierung. Int. Thomson Publishing, 1995 K. ten Hagen: Abstrakte Modellierung digitaler Schaltungen. Springer, 1995 T. Kropf: Introduction to Formal Hardware Verification. Springer Verlag S. Sjoholm, L. Lindh: VHDL for Designers. Prentice Hall Europe, 1997 K. C. Chang: Digital Design and Modeling with VHDL and Synthesis. IEEE Computer Society Press, 1996 Peter J. Ashenden: The Designer's Guide to VHDL. Morgan Kaufmann, 1995 D. Perry: VHDL. McGraw-Hill, 1998

Method(s) of instruction/ media being used	Talk, peer instruction, individual work, hands-on training, group work, case study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term
Compulsory requirements	none
Recommended requirements	Digital Systems, Computer Science Basics
Assessment	project work, written test 75 min
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	Project work (50%) and written test (50%)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 40 h lecture (preparation and rework) 25 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Digital Signal Processing, Microprocessor Technology, Embedded Systems; usable as compulsory optional module for CMT 6th semester usable as compulsory optional module for CMT 6th semester
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.403.1**
Module name	**Introduction in Digital Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The Student will be enabled to systematically design digital systems from the requirements analysis, the design, the simulation of the timing analysis to the implementation of complex functions in complex programmable circuits. Besides getting to know the design strategies the practical conversion for the design of a programmable SoC with a Hardware description language is emphasized. At the end of the module students know different design methodologies and are able to apply them in a given application context. The students know general methods of implementation for digital systems and they are able to evaluate their practicability. The students understand the design phases on different levels of abstraction and are able to establish appropriate design models. The students are able to apply basic synthesis approaches (such as, for example, high-level synthesis, scheduling and allocation, hierarchical decomposition, data- and control-path extraction, signal transition diagram and reachablitiy graph based synthesis of communication protocols, as well as ROBDD based logic synthesis) and ROBDD based verification approaches.
Module content	- Systematic design methodology for application specific integrated systems (levels of abstraction on the basis of the Y-diagram, synthesis types, basic design flow for the top-down synthesis of digital systems); - means of implementation for digital systems (programmable devices, application specific devices); - hardware description languages, background information and history, basic concepts of HDL-based simulation, synthesis and verification (signals and variables, time modeling concept and delta cycles, test benches, formal verification); - hardware description language VHDL, coding examples, special modeling techniques such as counters, utilization of RAM-Structures, finite state machine with data path (FSMD), process model graph (PMG), communication between synchronous and asynchronous FSMs, modeling on different levels of abstraction; - differences and similarities of VHDL, Verilog and SystemC.
Course type	2L - 0E - 1S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture notes, exercises, examples
Recommended literature	D. Gajski et al.: Specifications and Design of Embedded Systems. AddisonWesley, 1994 D. Gajski et al.: High-Level-Synthesis: Introduction to Chip and System Design. Kluwer Academic Publishers, 1992 G. Herrmann, D.Müller: ASIC - Entwurf und Test. Fachbuchverlag Leipzig, 2004 F. Rammig: Systematischer Entwurf digitaler Systeme. B.G. Teubner, 1989 T. Kropf: VLSI-Entwurf. Vorgehen, Methoden, Automatisierung. Int. Thomson Publishing, 1995 K. ten Hagen: Abstrakte Modellierung digitaler Schaltungen. Springer, 1995 T. Kropf: Introduction to Formal Hardware Verification. Springer Verlag S. Sjoholm, L. Lindh: VHDL for Designers. Prentice Hall Europe, 1997 K. C. Chang: Digital Design and Modeling with VHDL and Synthesis. IEEE Computer Society Press, 1996 Peter J. Ashenden: The Designer's Guide to VHDL. Morgan Kaufmann, 1995 D. Perry: VHDL. McGraw-Hill, 1998
Method(s) of instruction/ media being used	Talk, peer instruction, individual work, case study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term

Term	6. term
Compulsory requirements	none
Recommended requirements	Digital Systems, Computer Science Basics
Assessment	written test 75 min
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Digital Signal Processing, Microprocessor Technology, Embedded Systems; usable as compulsory optional module for CMT 6th semester
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.404**
Module name	**Electrical Drives**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba) - AT, Me (Ba)
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students will understand the work and the behavior of electrical machines. This gives the basic for understanding the typical solutions of power electronics for speed control. After successfully participating in this course, students are able to define the requirements for an electrical drive and to select the electrical machine and power electronics for the needed function.
Module content	Topics of the lecture are - Introduction: Explanation of the structure of drive systems, the conversion of energy related to the principles for generating mechanical forces and basics of mechanics - Basics of electrical machines with D.C. brush motors, induction motors and synchronous motors - Rating of machines - Control of machines: Control of D.C. motors, induction motors, AC-servomotors. Introduction to field orientated control and motion control The main topics are trained in lab sessions with the following experiments: - DC- motoer and induction motor - circle diagram of induction motors - D.C. motor with phase controlled rectifier - frequency converter - AC-servo motor - positioning system
Course type	4L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture papers and experiment instructions
Recommended literature	Fischer, F.: Elektrische Maschinen Müller, G.: Grundlagen Elektrischer Maschinen Specovius, J.: Grundkurs Leistungselektronik Gerke, W: Elektrische Maschinen und Aktoren
Method(s) of instruction/ media being used	Lecture and experiment
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term
Compulsory requirements	none
Recommended requirements	Electrical Engineering 1 and 2
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 90h of contact hours and 90h of self-study, consisting of: 20 h lecture (preparation and rework) 40 h practical training (preparation and evaluation) 30 h exam preparation
Usability of this module	Motion Control, Automation Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.405.1**
Module name	**Control Systems**
Sub module	Control Systems/ PLC
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	AT
Module coordinator	Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After students have attended the course, they are able to - interpret verbal control tasks, - recognize task classes and demonstrate the corresponding solution approaches - outline solutions - demonstrate solutions from common industrial systems
Module content	- general survey of control technique in automation - description-methods and – techniques - logic control - sequential control - structure and function of programmable logic controller (PLC) - programming according to the IEC-norm - Safety of control - implementation
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture script, lab instruction sheets, extracts of standards
Recommended literature	Wellenreuther, G. u.a.: Automatisieren mit SPS – Theorie und Praxis; Wiesbaden: Vieweg von Aspern, J: SPS-Softwareentwicklung mit IEC 61131; Heidelberg: Hüthig Seitz, M.: Speicherprogrammierbare Steuerungen; München, Leipzig: Carl Hanser
Method(s) of instruction/ media being used	Team work, reflections in the plenum, lab sessions
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4th term
Compulsory requirements	none
Recommended requirements	Digital Systems: Boolean Algebra, Flip Flops
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6 for the whole module (ET1.405)
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Automation Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.405.2**
Module name	**Control Systems**
Sub module	Motion Control
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba) - AT
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The knowledge in the areas of electrical drives, power electronics, electromagnetic compatibility, motion control and automatic control will be improved. The students test in practice how the different components work together. After attending the event, the students are able to put electric drives into operation and understand and measure power flows, additional students can present their results together in lectures.
Module content	Induction machines and D.C. brush machines with rated outputs of 3 kW to 5 kW together with frequency converters and phase controlled rectifiers are tested. The converters are linked with PC. Topics are the parameterization of the converters, the power flow in the arrangement, problems of electromagnetic compatibility, vector control of induction machines and the behavior in open- and closed loop control. The work is done in groups. The students will explain and discuss their results in oral presentations.
Course type	0L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lab instruction sheet
Recommended literature	Manuals of the used components
Method(s) of instruction/ media being used	Practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Electrical Drives
Assessment	term paper
Assessment modalities	APL - during term(graded)
ECTS credits	6 for complete module control systems (ET.1.405)
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 40 h practical training (preparation and evaluation) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.406.1**
Module name	**Image Processing / Image Analysis**
Sub module	Image Processing
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. Sebastian Knorr
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student should learn the fundamental procedures for digitizing and processing images. He/She should be able to apply adequate software such as ImageJ and is able to implement basic image processing methods.
Module content	- Introduction to the fundamentals of digital image processing - Digitisation: scanning, quantisation, scanning theorem - Gray-scale statistic: average value, variance, entropy, co-occurrencematrix - Point operators: E.g., histogram equalization, gamma correction - Local operators: linear and non-linear filters, smoothing, median filtering, edge filtering, unsharp mask - Global operators: 2D Fourier Transform, Discrete Cosine Transform - Image segmentation, region labeling, simple region descriptors - Color image processing, color spaces - Fundamentals of feature extraction and pattern recognition
Course type	(Lecture, Exercises, Seminar, practical course)
Recommended literature	Burger, Wilhelm und Burge, Mark J.: Digitale Bildverarbeitung: Eine algorithmische Einführung mit Java, Springer, Auflage 20. Erhardt, Angelika: Einführung in die Digitale Bildverarbeitung, Vieweg + Teubner, 2008.
Method(s) of instruction/ media being used	3L - 2E - 0S - 0P
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. or 6. term
Compulsory requirements	none
Recommended requirements	Signal Processing, Basics in computer programming, Algorithms and data structures
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 80 h lecture (preparation and rework) 25 h exam preparation
Usability of this module	Analysis 2, Numerical Mathematics/Optimization
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.406.2**
Module name	**Image Processing / Image Analysis**
Sub module	Image Analysis
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr.-Ing. Sebastian Knorr
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students should learn the fundamental methods for describing and representing images via transformations and irrelevance reduction methods. Furthermore, the students get to know methods for pattern recognition in images via extraction of characteristic features and classification via different supervised learning methods. Finally, they are able to use common software libraries for computer vision tasks such as OpenCV.
Module content	- Hough transform: Recognition of lines and simple curves - Interest point detection, Harris detector - Transformations: Discrete Wavelet transform (1D and 2D), Haar Wavelets - Feature extraction, representation of image regions, SIFT features, bag of words - Pattern recognition and machine learning, supervised and unsupervised learning methods: K-Means clustering, agglomerative clustering, Bayes classification, neural networks, support vector machines, Adaboost - Face detection and face recognition - Object detection and recognition
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Scripts and lab instruction sheets on the Internet
Recommended literature	-Burger, Wilhelm und Burge, Mark J.: Digitale Bildverarbeitung: Eine algorithmische Einführung mit Java, Springer Vieweg, 3. Auflage, 2015. - Burger, Wilhelm und Burge, Mark J.: Principles of Digital Image Processing, Vol. 3, Springer-Verlag, 2009, 2013. - Tilo Strutz: Bilddatenkompression, Vieweg + Teubner, 4. Auflage (2009). - Nischwitz, Alfred, Fischer, Max, Haberäcker, Peter, Socher, Gudrun: Computergrafik und Bildverarbeitung, Band 2: Bildverarbeitung, Vieweg und Teubner, 3. Auflage, 2011. - Weitere Literaturangaben in der Vorlesung
Method(s) of instruction/ media being used	Interactive lecture, practical course, self-study, exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Signal Processing, Computer Science, Image Processing / Image Analysis 1
Assessment	Laboratory internship report, Programming assignment
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 30 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Video Engineering
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.407**
Module name	**Optoelectronics 1**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	AT, KMT
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students acquire knowledge of the operating conditions of optoelectronic basic components. This enables them to design and develop simple optoelectronic assemblies and systems. Due to the intensive study of the basics of optoelectronics and technical optics, graduates are able to familiarize themselves with new tasks in optoelectronic system development at short notice.
Module content	- Mediation of the theoretical bases to photonics events in semiconductor structures; - Functional conditions and qualities of optoelectronic transmitter and detection devices considering her specific use fields; - Interaction of the construction elements in typical application cases; - Application of optoelectronics in automation technology - Introduction to transmission technology
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture script, collection of exercises
Recommended literature	- Paul: Optoelektronische Halbleiterbauelemente, Teubner-Verlag, 1992 - Jansen: Optoelektronik, Vieweg, 1993 - Jones: Optoelektronik, VCH, 1992 - Brückner: Optische Nachrichtentechnik, Teubner, 2003 - Krieg: Automatisieren mit Optoelektronik, Vogel, 1992
Method(s) of instruction/ media being used	lectures, self-study, discussion at the practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summerterm
Term	4th term
Compulsory requirements	none
Recommended requirements	Electronic Components, Physics, Mathematics
Assessment	written test
Assessment modalities	PL – exam during audit period(graded)
Further Information	The module examination consists of a written test. In the test, students create solutuions for selected optoelectronic questions, and calculate various technically relevant variables and parameters based on given practical examples
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 55 h lecture (preparation and rework) 35 h practical training (preparation and evaluation) 30 h exam preparation
Usability of this module	Optoelectronics II Laser Techniques Optical and Optoelectronical Sensors Optoelectronical Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.407.1**
Module name	**Introduction to optoelectronics**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	Ti
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	- Knowledge of the effect conditions of the optoelectronic basic components; - Conception of simple modules; - Construction and testing of simple engineering samples of optoelectronic modules - Knowledge of applications of optoelectronics
Module content	- Mediation of the theoretical bases to photonics events in semiconductor structures; - Functional conditions and qualities of optoelectronic transmitter and detection devices considering her specific use fields; - Interaction of the construction elements in typical application cases; - Application of optoelectronics in automation technology - Introduction to transmission technology
Course type	2L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture script, collection of exercises
Recommended literature	- Paul: Optoelektronische Halbleiterbauelemente, Teubner-Verlag, 1992 - Jansen: Optoelektronik, Vieweg, 1993 - Jones: Optoelektronik, VCH, 1992 - Brückner: Optische Nachrichtentechnik, Teubner, 2003 - Krieg: Automatisieren mit Optoelektronik, Vogel, 1992
Method(s) of instruction/ media being used	lectures, self-study, discussion at the practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6. term
Compulsory requirements	none
Recommended requirements	Electronic Components, Physics, Mathematics
Assessment	Exam 60 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h exam preparation
Usability of this module	Optoelectronics II Laser Techniques Optical and Optoelectronical Sensors Optoelectronical Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.408**
Module name	**Introduction in Communication Engineering**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - have a general idea of telecommunication engineering, its history and the specific fields and are able to relate issues to these fields - understand basic functions and relations of communikation networks - are able to solve some simple problems in theory of information and coding, radio frequency technology and communication networks
Module content	- basics of telecommunication engineering - historical development of telecommunication engineering - communication networks: basic principles, structures, layer model and services - information and coding theory: basic principles, sources, source coding, channel coding and Modulation - radio frequency technology: basic principles, Maxwell equations, electromagnetic waves, processes in waveguides, basics of antennas and rf-transmission
Course type	2L - 0E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Books, scripts and exercises on the Internet
Recommended literature	- Bossert, M.: Einführung in die Nachrichtentechnik. Oldenbourg Verlag - Werner, M: Nachrichtentechnik. Verlag Vieweg - Mayer, M.: Kommunikationstechnik. Verlag Vieweg - Meinke, H, Gundlach, F. W.: Taschenbuch der Hochfrequenztechnik. Springer-Verlag
Method(s) of instruction/ media being used	Lectures will take the form of seminars, exercises, simulations and self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term
Compulsory requirements	none
Assessment	exam 60 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90 h of total work load, thereof 30 h of contact hours and 60 h of self-study, consisting of: - 30 h lecture (preparation and rework) - 30 h exam preparation
Usability of this module	Radio Frequency Technology, Transmission Technique, Communication Networks
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.409**
Module name	**Databases**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	TI
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Students knowtoolsfor modeling and implement database systems and can this also apply. Students are able to analyze data sets and arrange in the form of data models. Students are able to implement relational databases. Students are capable to implement standard interfaces.
Module content	Basic Database Concepts, Architecture and Components of database systems, - Entity-Relationship Model, Basics of relational databases including Normal Forms, Standard query language SQL, Current database systems, standard interfaces for database integration
Course type	1,5L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	PowerPoint slides, DB programs, laboratory excercises
Recommended literature	- Elmasri/Navathe: Grundlagen von Datenbanksystemen, Addison Wesley - SQL Grundlagen und Datenbankdesign, RRZN Hannover, HERDT-Verlag
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term
Compulsory requirements	none
Recommended requirements	Informatik
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 37,5h of contact hours and 52,5h of self-study, consisting of: 22 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 15 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.410**
Module name	**Software Engineering**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Specialization/ Profil	TI
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to understand methods for sysematic software design - to assess requirements analysis methods by example problems - to apply application software planning methods for micro computers and micro controllers - to apply best practice methods of software quality assurrance
Module content	Principles, Procedures, Methods, Tools for Development, Service and Support of Software, Software Development Models and Phases, V-Model, Basic Concepts of Object-Oriented Software Develpoment, Fundamentals of the Unified Modelling Language (UML), Software Test and Validation Methods
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	2L - 2E - 0S - 0P
Recommended literature	- Helmut Balzert. Lehrbuch der Software-Technik, Band 1. Software Entwicklung. Spektrum Akademischer Verlag, Heidelberg Berlin, 2. Aufl., 2000. - Helmut Balzert. Lehrbuch der Software-Technik, Band 2. Software-Management, Software-Qualitätssicherung und Unternehmensmodellierung. Spektrum Akademischer Verlag, Heidelberg Berlin, 2. Aufl., 1998. - Ian Sommerville. Software engineering. Addison-Wesley, Harlow [u.a.], 8. edition, 2007. - Wolfgang Zuser, Thomas Grechenig, und Monika Köhle. Software-Engineering mit UML und dem Unified Process. Pearson Studium, München [u.a.], 2., überarb. Aufl., 2004.
Method(s) of instruction/ media being used	lecture, practical course, exercises, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term - ET/IT-TI 6. term - ATITi
Compulsory requirements	none
Recommended requirements	Computer Science
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to conduct an extensive software development project
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 90 h lecture (preparation and rework) 30 h exam preparation
Usability of this module	Operating Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.411**
Module name	**Digital Signal Processing**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Obtain the skills for design, simulation and evaluation of digital systems using transformation as well as for estimation of the impact resulted by the quantization of values
Module content	Sampling theorem for low- and bandpass signals – discrete Fourier-Transform – windowing – z-Transform – FIR- and IIR-Structures – quantization noise – signal to noise ratio – sampling rate conversion – approximation of continuous-time by discrete-time processes – transmission behaviour of digital systems in z-domain – test of stability
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture scripts, tasks and solutions, simulation scripts
Recommended literature	Scheithauer, R.: Signale und Systeme Kreß, D.; Irmer, R: Angewandte Systemtheorie Meyer, M.: Grundlagen der Informationstechnik v. Grünigen, D. Ch.: Digitale Signalverarbeitung Brigham, E. O.: FFT-Anwendungen
Method(s) of instruction/ media being used	Lectures, exercises, simulations by software tool MATLAB
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	4. term
Compulsory requirements	none
Recommended requirements	Mathematics, Basics of Electrical Engineering, Computer Science, Theory of Signals and Systems, Control Engineering, MATLAB
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90 h of total work load, thereof - 45 h of contact hours and - 45 h of self-study, consisting of: preparation and rework lecture 15 h practical training 15 h (preparation and evaluation) exam preparation 15 h
Usability of this module	Usable for modules related to processing of informations.
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501**
Module name	**Nontechnical complusory elective modules**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Compulsory/ optional/ electiv	optional
Module content	The compulsory elective module (6 ECTS credits) makes it possible to select modules from a range of different compulsory elective modules according to the interests and inclinations of the students. The following modules are available: ET.1.501.1 Business Administration ET.1.501.2 Management of projects ET.1.501.3 Working world of the future ET.1.501.4 Business game company foundation ET.1.501.5 E-Business Innovation startup foundation ET.1.501.6 Business Administration and Business Planning I and II ET.1.501.7 Innovation Management For more information see module description. Exact content see corresponding module description.
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winterterm or Summer term
Term	5th or 6th term
ECTS credits	6
Workload	180 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.1**
Module name	**Applied Business Administration**
Sub module	Business Administration
Department	Business Administration
Degree program	ET/IT (Ba)
Module coordinator	Fachbereich Betriebswirtschaft, Department Business Administration
Compulsory/ optional/ electiv	optional
Learning objectives	- Ability of scientific, economic thinking as well as recognition of basic interrelations in industrial enterprises. - Getting to know fundamental management functions and their application.
Module content	- Basic model of an enterprise and its constitutive characteristics. - Structures and processes within an enterprise. - The management of enterprises and decision-oriented methods.
Course type	0L - 0E - 2S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, additional material
Recommended literature	- Härdler, J. (Hrsg.): Betriebswirtschaftslehre für Ingenieure, 2. Aufl., München, Wien 2007. - Steinmann, H.; G. Schreyögg: Management – Grundlagen der Unternehmensführung, 6. Aufl., Wiesbaden 2005.
Method(s) of instruction/ media being used	Seminar, self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6 (for the entire module ET.1.501)
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 40 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 20 h exam preparation
Usability of this module	Applied Business Administration/Management of Projects
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.2**
Module name	**Management of Projects**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Nina Hauser
Compulsory/ optional/ electiv	optional
Learning objectives	- Ability of scientific, economic thinking as well as recognition of basic interrelations in industrial enterprises. - Getting to know fundamental management functions and their application.
Module content	- Basic model of an enterprise and its constitutive characteristics. - Structures and processes within an enterprise. - The management of enterprises and decision-oriented methods.
Course type	0L - 0E - 2S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, additional material
Recommended literature	- Härdler, J. (Hrsg.): Betriebswirtschaftslehre für Ingenieure, 2. Aufl., München, Wien 2007. - Steinmann, H.; G. Schreyögg: Management – Grundlagen der Unternehmensführung, 6. Aufl., Wiesbaden 2005.
Method(s) of instruction/ media being used	Seminar, self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Recommended requirements	Applied Business Administration (ET.1.501.1)
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6 (for the entire module)
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 40 h lecture (preparation and rework) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.3**
Module name	**Working world of the future**
Department	Industrial Engineering
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr. Christian Erfurth, Prof. Dr. Oliver Jack
Compulsory/ optional/ electiv	optional
Course type	0L - 0E - 2S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	http://www.bmas.de/DE/Service/Medien/Publikationen/a883-weissbuch.html; aufgerufen am 21.03.2017
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winterterm or Summer term
Term	5th or 6th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	30 h contact hours and 60 0h of self-study
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.4**
Module name	**Business game company foundation**
Department	Business Administration
Degree program	ET/IT (Ba)
Module coordinator	Dr. Arndt Lautenschläger / Prof. Dr. Heiko Haase
Compulsory/ optional/ electiv	optional
Course type	0L - 0E - 2 - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Nagl, Anna: Der Businessplan: Geschäftspläne professionell erstellen, Springer Gabler, 7. Aufl., 2013.
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	5. oder 6. Semester
Term	5th or 6th term
Compulsory requirements	none
Assessment	Presentation, game results
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	30 h contact hours and 60 0h of self-study
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.5**
Module name	**E-business innovation and startup foundation**
Department	Business Administration
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr. Andrej Werner, Prof. Dr. Heiko Haase
Compulsory/ optional/ electiv	optional
Course type	0L - 0E - 4S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	/1/ Wirtz: Business Model Management. Springer-Gabler 2013. /2/ Clement; Schreiber: Internet-Ökonomie. Springer 2013 /3/ Krause: Kreativität, Innovation, Entrepreneurship. Springer-Gabler 2013. /4/ Schallmo: Kompendium Geschäftsmodell-Innovation. Springer-Gabler 2014. /5/ Osterwalder: Business Model Canvas. Dissertation. 2004. /6/ Klandt: Gründungsmanagement. Oldenbourg, 2. Aufl., 2005. /7/ Oehlrich: Betriebswirtschaftslehre - Eine Einführung am Businessplan-Prozess, 3. Aufl., Vahlen 2013. /8/ Kußmaul: Betriebswirtschaftslehre für Existenzgründer, 7. Aufl., Oldenbourg 2011. /9/ Grichnik; Brettel; Koropp; Mauer: Entrepreneurship - Unternehmerisches Denken, Entscheiden und Handeln in innovativen und technologieorientierten Unternehmungen, Schäffer-Poeschel 2010.
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	Winter term or summer term
Term	5th or 6th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.6**
Module name	**Business Administration and Business Planning**
Department	Business Administration
Degree program	ET/IT (Ba)
Module coordinator	Fachbereich Betriebswirtschaft, Department Business Administration
Compulsory/ optional/ electiv	optional
Course type	4L - 0E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Klandt, Heinz, Gründungsmanagement, Oldenbourg Wissenschaftsverlag, 2. Aufl., 2005. Oehlrich, Marcus: Betriebswirtschaftslehre - Eine Einführung am Businessplan-Prozess, 3. Auflage, Verlag Vahlen 2013. Kußmaul, Heinz: Betriebswirtschaftslehre für Existenzgründer, 7. Auflage, Oldenbourg Verlag 2011
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term and winter term
Term	5th and 6th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	60 h contact hours and 120 0h of self-study
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.501.7**
Module name	**Innovation management**
Department	Business Administration
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr. Heiko Haase
Compulsory/ optional/ electiv	optional
Course type	0L - 0E - 2 - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Vahs, Dietmar; Brem, Alexander: Innovationsmanagement: Von der Idee zur erfolgreichen Vermarktung, 4. Auflage, Schäffer-Poeschel: Stuttgart 2013. Hauschildt, Jürgen; Salomo, Sören: Innovationsmanagement, 6. Aufl., Vahlen: München 2013. Disselkamp, Marcus: Innovationsmanagement, 2. Aufl., Springer Gabler: Wiesbaden 2012.
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term or summer term
Term	5th or 6th term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	30 h contact hours and 60 0h of self-study
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.502**
Module name	**Modelling/ Simulation**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba) - AT
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Basic skills of the experimental and theoretical modelling using MATLAB and Simulink.
Module content	- Experimental modeling, theoretical modelling -static signal models, static system models -dynamic signal models, dynamic system models -determined and stochastic signals and systems
Course type	4L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	- graphical material of the lecture - transformation table - excercises with Matlab/Simulink
Recommended literature	B. Girod, (2003) Einführung in die Systemtheorie, 2.Auflage, Teubner Verlag Stuttgart R. Isermann, (1991) Identifikation dynamischer Systeme 1, Springer Verlag Berlin R. Isermann, (1992) Identifikation dynamischer Systeme 2, Springer Verlag Berlin J. Lunze (2002) Regelungstechnik 2, Springer Verlag Berlin R. Storm, (2001) Wahrscheinlichkeitsrechnung, mathematische Statistik und statistische Qualitätskontrolle, 11. Auflage, Fachbuchverlag Leipzig H. Strobel, (1975) Experimentelle Systemanalyse , Akademie Verlag Berlin J. Wernstedt (1989) Experimentelle Prozeßanalyse, Verlag Technik Berlin
Method(s) of instruction/ media being used	lecture, excercise, blackboard and graphical material via data projector
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	Control Theory Theory of Signals and Systems
Recommended requirements	- analysis - algebra - stochastic - physics
Assessment	written university exam 90 min
Assessment modalities	PL – during period of exams (graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 80 h lecture (preparation and rework) 25 h exam preparation
Usability of this module	- digital control Systems - optimal control theory
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.503**
Module name	**Automation Systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After students have attended the course, they are able to - clarify and describe an automation concept for a simple technical system - select devices and device structures and assess and compare their reliability - demonstrate solutions on commonly used systems
Module content	- tasks of automation - devices systems and their structures - periphery to process periphery - components close to process - display and control components - Open systems vs. compact systems - availability, reliability, redundancy, safety, explosion protection - design: phases, methods, product concept catalogue , customer requirement specification, processing
Course type	3L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Recommended literature	-Bergmann, J.: Automatisierungs- und Prozessleittechnik; Leipzig: Fachbuchverlag -Bindel, T. u.a.: Projektierung von Automatisierungsanlagen; Wiesbaden: Vieweg -Langmann, R.: Taschenbuch der Automatisierung; Leipzig:Fachbuchverlag
Method(s) of instruction/ media being used	Lecture script, lab instruction sheets, extracts of standards
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	none
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 50 h lecture (preparation and rework) 35 h practical training (preparation and evaluation) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.504.1**
Module name	**Process Communication**
Sub module	Field Bus
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	AT, TI
Module coordinator	Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After students have attended the course, they are able to - interpret a task related to process communication, - generalize the task, - compare different industrial solutions, - select devices and device structures, - demonstrate solutions on commonly used systems
Module content	- communication in automation technology: requirements, technologies - Basics of communication, logical models of LAN, embedding in concept of common communication systems - classification by topology, transmission, and access methods - Internetworking (Bridging, Switching, Routing) - wireless LAN, Industrial Ethernet - ProfiNet, CANopen, Powerlink, OPC-UA
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, lab instruction sheets, extracts of standards
Recommended literature	Furrer, F. J.: Industrieautomation mit Ethernet-TCP/IP und Web-Technologie; Heidelberg: Hüthig Etschberger,K.: Controller-Area-Network; München, Wien: Hanser Popp, M.: Das PROFINET IO-Buch; Heidelberg: Hüthig Schnell, G.: Bussysteme in der Automatisierungstechnik; Braunschweig, Wiesbaden: Vieweg
Method(s) of instruction/ media being used	teamwork, reflections in plenum, practical course (in 6th semester – during sub-module ET.1.504.2)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term, summer term
Term	5th term lecture 6th term practical course
Compulsory requirements	none
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 40 h lecture (preparation and rework)
Time	According time table
Duration of module	2 terms
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.504.2**
Module name	**Process Communication**
Sub module	Local Area Networks (LAN)
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), Me (Ma)
Specialization/ Profil	AT, Ti -> ET/IT (Ba)
Module coordinator	Prof. Dr. Ludwig Niebel, Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - have a general idea of local area networks and understand importand functions - have a basic knowledge about networks using internet protocols - are able to calculate network loads, - are able to handle some simple configuration and test tasks
Module content	- Basics of communication, logical LAN-models, embedding into the concept of common communication systems - Classification by topology, transmission techniques and access methods - LAN-standardisation and open systems interconnection model - Wiring systems - Overview of access methods - CSMA/CD-Ethernet basics and historical development - 10 M, 100M, 1G und 10G Ethernet - additional technologies (AUTONEG and others) - Internetworking (Bridging, Switching, Routing) - wireless LAN
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script and lab instruction sheets
Recommended literature	- Spurgeon, C. E.: Ethernet, O'Reilly 2000 - Johnson, H. W.: Fast Ethernet, Prentice Hall PTR 1996 - Halsall, F.: Data Communications, Computernetworks and Open Systems, Addison-Wesley 1995 - Martin Werner: Netze, Protokolle, Schnittstellen und Nachrichtenverkehr, Verlag Vieweg 2005 - Perlman, R.: Bridges, Router, Switches und internetworking-Protokolle, Addison Wesley 2003
Method(s) of instruction/ media being used	Lecture, teamwork, reflections in plenum, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6, in combination with modul Field Bus
Workload	110h of total work load, thereof 45h of contact hours and 65h of self-study, consisting of: 25 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 25 h exam preparation
Time	According time table
Duration of module	2 terms
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.505**
Module name	**Computer Graphics**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	TI, KMT
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students should learn fundamental procedures and methods for 3D modelling and for visualising (and animation of) of virtual worlds, and apply them on suitable software (3D-StudioMax, Blender, RenderMan).
Module content	- Geometric modelling: Polygons, splines, Bezier - 3D description: projections, camera description, canonical image space, parallel projection - Screening: Pixel, polygons, scan line algorithm - Visibility: Coherence, painters, BSP-Trees, back face culling, Z-buffer, level of detail... - Models for illumination: illumination, light source, ambient light, diffuse reflection, direct reflection, reduction, colour - Textures: global illumination models, ray tracing, radiosity, texture modulation, texture sources, filtering, bump maps, light maps, shadow maps, aliasing
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	2L - 1E - 0S - 1P
Recommended literature	- Nischwitz, A., Fischer, M., Haberäcker, P., Socher, Gudrun: Computergrafik und Bildverarbeitung, Band 1: Computergrafik, 3. Auflage, Vieweg+ Teubner, 2011. - Schiele, H.G.: Compuergrafik für Ingenieure: Eine anwendungsorientierte Einführung, Springer Vieweg, Berlin Heidelberg, 2012.
Method(s) of instruction/ media being used	Interactive lecture, practical course, work in little teams, self-study, exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Computer Science, Image Processing
Assessment	project work
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 65 h lecture (preparation and rework) 25 h practical training (preparation and evaluation) 30 h exam preparation
Usability of this module	Digital Image Processing I, Video Engineering
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.506.1**
Module name	**Radio Frequency Technique**
Sub module	Radio Frequency Technique 1
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - understand the influence of transmission lines on high frequent signals, the function as a waveguide - are able to use lines for different applications - are able to use the model of waves for different problems in RF engineering - understand the effect and the parameters of antennas and the propagation of electromagnetic waves - are able to calculate the free space propagation
Module content	- Transmission Line Model and Solution of Wave Equations in stationary case - Reflection and Standing Waves on Transmission Lines - Transmission Lines used as Circuit Elements - The Smith-Chart and its applications - Basics and technical description of Antennas - radio propagation, different conditiones for using
Course type	2L - 0E - 1S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	script and exercises on the Internet
Recommended literature	- Meinke; Gundlach: Taschenbuch der Hochfrequenztechnik.Springer - Zinke; Brunswig: Lehrbuch der Hochfrequenztechnik Band 1 und Band 2. Springer - Hoffmann: Hochfrequenztechnik, ein systemtheoretischer Zugang. Springer
Method(s) of instruction/ media being used	lecture, exercises, simulations, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	none
Recommended requirements	Electrical Engineering, Signal Processing, Introduction in Communication Engineering, linear ordinary and partial differential equations
Further Information	The assessment takes place at the end of the second submodule Radio Frequency Technique 2.
ECTS credits	6, in combination with Radio Frequency Technique 2Frequency Technique 1+2
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 30 h lecture (preparation and rework) 15 h seminar (preparation and evaluation)
Usability of this module	Radio Frequency Technique 2
Time	According time table
Duration of module	2 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.506.2**
Module name	**Radio Frequency Technique**
Sub module	Radio Frequency Technique 2
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - understands the main function blocks of RF devices and functions of RF devices - are able to use major function blocks - are able to determine major parameters of some function blocks
Module content	Amplifiers, HF-transistors and noise oscillation generation, oscillators frequency conversion, composition frequency selective elements receiver and transmitter
Course type	1L - 0E - 1S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script, exercises and lab instruction sheets on the Internet
Recommended literature	Meinke; Gundlach: Taschenbuch der Hochfrequenztechnik. Springer Zinke; Brunswig: Lehrbuch der Hochfrequenztechnik Band 1 und Band 2. Springer Hoffmann: Hochfrequenztechnik, ein systemtheoretischer Zugang Springer
Method(s) of instruction/ media being used	Lecture, seminar, simulations, lab sessions, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Recommended requirements	Electrical Engineering, Signal Processing, Introduction in Communication Engineering, linear ordinary and partial differential equations, Radio Frequency Technique 1
Assessment	exam 120 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6, in combination with Radio Frequency Technique 1
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 10 h lecture (preparation and rework) 10 h seminar (preparation and rework) 10 h practical training (preparation and evaluation) 15 h exam preparation
Time	According time table
Duration of module	2 terms
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.507**
Module name	**Communication Networks**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - have a general idea of communication networks and understand important main functions and principles - knows technologies and protocols of line-switched and packet-switched networks - are able to calculate network loads, - are able to handle configuration and test tasks
Module content	- wide area networks, connection oriented systems (PDH, SDH, ISDN) - wide area networks, packet systems (ATM, MPLS, Metro Ethernet, IP networks) - wide area networks - access networks, DSL systems - local networks, Ethernet and Wireless LAN - important features and apllications aspects - network management
Course type	4L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Books, Script and lab instruction sheets on the Internet
Recommended literature	Bossert, M., Breitbach, M.: Digitale Netze, Verlag B.G. Teubner 1999 Martin Werner: Netze, Protokolle, Schnittstellen und Nachrichtenverkehr, Verlag Vieweg 2005 Hochmut, M., Wildenhain, F.: ATM-Netze, Architektur und Funktionsweise, International Thomson Publishing 1995 Minei, I., Lucek, J.: MPLS-enabled Applications, John Wileyand sons 2008 Spurgeon, C. E.: Ethernet, O'Reilly 2000 Johnson, H. W.: Fast Ethernet, Prentice Hall PTR 1996 Perlman, R.: Bridges, Router, Switches und internetworking-Protokolle, Addison Wesley 2003
Method(s) of instruction/ media being used	Lecture in the form of a seminar, lab session, self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	none
Recommended requirements	Signal Processing, Computer Science, Digital Systems, Introduction in Communication Engineering
Assessment	exam 120 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	170 h Gesamtarbeitsaufwand, davon - 75 h Präsenzstunden (SWS) - 95 h Selbststudium, bestehend aus: - 60 h Vorlesung (Vor- und Nachbereitung) - 15 h Praktikum 15 (Vorbereitung und Auswertung - 20 h Prüfungsvorbereitung
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.508**
Module name	**Mobile Computing / Software Engineering for mobile systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	Computer Engineering (CE), Communication and Media Technology (CMT)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	compulsory in specialization CE, optional in specialization CMT
Learning objectives	At the end of the module students are able: - to apply software development method for mobile devices - to assess specifics of distributed mobile application compared to standard PC-applications - to generate and adapt mobile apps - to understand the Android operating system
Module content	Fundamentals of Software Development for Mobile Systems, Introduction to Platform-Specific Programming Languages and Paradigms. Application Architecture and User Interaction, and Generation and Connection of the User Interface, Access to Internal Device Hardware, such as GPS, Compass, Camera), Using Standard APIs and Handling Error States, Connection to Servers and Web Services: Client / Server Communication
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Scripts and exercises
Recommended literature	- Uwe Post: Android-Apps entwickeln. Galileo Computing, 2012 - Florian Franke, Johannes Ippen: Apps mit HTML5 und CSS3: Für iPhone, iPad und Android. Galileo Computing, 2013 - Raj Kamal: Mobile Computing. Oxford University Press, 2012
Method(s) of instruction/ media being used	Interactive lecture, work in little teams, self-study, exercises
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Computer Science, Knownledge in object-oriented programming
Assessment	term paper and presentation
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to conduct an extensive software development project.
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 95 h lecture (preparation and rework) 25 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.509.1**
Module name	**Operating Systems**
Sub module	Operating Systems
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	TI
Module coordinator	Prof. Dr. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students are able to characterisetasks and function modes of operating systems, and to analyse fundamental operating system concepts, their implementations, and their properties. Additionally they can apply operating system function in application programming.
Module content	- Functions of operating systems, composition of computers, operating system concepts, system calls, architecture of operating systems, virtual machines - Processes and threads: Fundamentals, condition models - Synchronisation: critical ranges, barriers, semaphors, monitors, deadlocks - Process communication: Signals, RPC - Scheduling: FIFO, Round Robin, priorities - Storage management: Address area, swapping, virtual storage management systems - File systems: Files and file access, listings, structure of a file system - Input/output: Devices, access to devices - Command shells
Course type	2L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script
Recommended literature	Andrew S. Tanenbaum: Moderne Betriebssysteme, 2. Auflage, Pearson Studium, 2003. William Stallings: Betriebssysteme, 4. Auflage, Pearson Studium, 2003. A. Silberschatz, P. Galvin, J. Peteron: Operating System Concepts, John Wiley and Sons, 2001
Method(s) of instruction/ media being used	Lecture, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Basics of Programming, Algorithms and data structures
Assessment	course attendance certificate
Assessment modalities	SL - ungraded course work during the lecture period
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h exam preparation
Usability of this module	Real Time Operating Systems (ET.1.509.2)
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.509.2**
Module name	**Operating Systems**
Sub module	Real Time Operating Systems
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	TI
Module coordinator	Prof. Dr. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to categorize objectives and functionality of real-time systems - to distinguish basic real-time operating system concepts and their potential pitfalls - to assess real-time scheduling Methods - to apply methods and tools for application proramming using real-time operation systems - to apply real-time system design methods
Module content	Typical Applications of Real-Time Systems, Structure of a Real-Time System, Characteristics of Real-Time Systems: Time and Event-Controlled Systems, Periodic and Sporadic Tasks, Task Coordination, Architecture Characteristics of a Real-Time Processing System,Real-Time Scheduling: Static Process Planning, Dynamic Process Planning, Algorithms for Dynamic Process Planning, Scheduling Analysis, Systematic Design of Real-Time Systems: Structured Analysis, Real-Time Analysis
Course type	3L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script
Recommended literature	- D.L. Buhr, R.J.A.and Bailey. An Introduction to Real-Time Systems: From Design to Multitasking with C/C++. Prentice Hall, Upper Saddle River, 1998. - Hermann Kopetz. Real-Time Systems. Design Principles for Distributed Embedded Applications. Kluwer Academic Publishers, Dordrecht, London, 1997. - Phillip A. Laplante. Real-Time Systems Design and Analysis. IEEE Computer Society Press, Los Alamitos, second edition, 1997. - Dieter Zöbel and Wolfgang Albrecht. Echtzeitsysteme: Grundlagen und Techniken. International Thomson Publishing, Bonn, 1995.
Method(s) of instruction/ media being used	Lecture, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6. term
Compulsory requirements	none
Recommended requirements	Computer Science, Operating Systems, Software Engineering
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to conduct a software development project for a real-time system
ECTS credits	9 (for the total modul)
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 90 h lecture (preparation and rework) 30 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.510**
Module name	**Intercultural Communication 2**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Achieving intercultural competence in international engineering processes andinternational business, development of synergies, win-win-strategies, attitudes and problem-solving strategies which are different from those in one's own culture; ability to recognize and analyse hidden misunderstandings.
Module content	The students develop within the framework of a semester abroad an intercultural case studie. The work should referring to the target culture in which the student is staying. It should be related to engineering and especially to topics of automation and information technology. The context of the host country and the host university, the contrast to German culture and own experianecs are to discuss.
Course type	0L - 0E - 2S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	- Thomas, Alexander (Hg.), Handlungskompetenz im Ausland. Buchreihe „Beruflich in …" <Zielländer>. Göttingen. Vandenhoek& Ruprecht
Method(s) of instruction/ media being used	Exchange of information via internet in the time of study abroad.
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Modul Intercultural Communication 1
Assessment	report
Assessment modalities	SL - ungraded course work during the lecture period
ECTS credits	6
Workload	180h of total work load, thereof 30h of contact hours and 150h of self-study
Time	According time table
Duration of module	1 term
Place/ room	University abroad
Frequency of offer	Annually
Language	German

Module number	**ET.1.511**
Module name	**Modules abroad**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students should acquire solid knowledge in the areas of the elected courses. Moreover they will broaden their scientific knowledge and practical skills through the foreign perspective onto their field of work. By becoming familiar with the other country and its culture they will develop a better understanding for other cultures. Self-responsibility and flexibility will be facilitated as well as the understanding of a foreign language.
Module content	The students should take part in courses of a foreign university with following topics or with topics which are comparable to the following topics - Curcuit Design - Analogue Circuit Design - Control Systems - Modelling/ Simulation - Automation Systems - Field Bus - Microcomputer Design - Signal Processors - Web Design - Distributed Systems/Mobile Computing - Operating Systems - Real-Time-Operating Systems - Computer Graphics - Optoelectronics - Database The contents will be aligned by the students between the foreign university and the examination board of the department. The results will be fixed in a Learning Agreement. The agreement will be proved and recommended by the leader of the degree programme. The examination board has to certificate it. A suitable level of quality and a suitable work load are to ensure. The topics of the courses can be seen in the description's of the single modules. This topics, the way of teaching, the amount of teaching and the way of examination are recommendations. In minimum 50 % of the courses abroadshould be comparable to the mentioned courses (core area).
Course type	according to the module of the foreign university. (Lecture, Exercises, Seminar, practical course)
Learning Material	according to the module of the foreign university.
Recommended literature	according to the module of the foreign university.
Method(s) of instruction/ media being used	according to the module of the foreign university.
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	completion of modules up to th e3rd smesers, signing of a learning agreement
Assessment	see Learning Agreement
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	24
Usability of this module	See module description of the respective module
Time	According time table
Duration of module	1 term
Place/ room	University abroad
Frequency of offer	Annually
Language	language of university abroad

Module number	**ET.1.601**
Module name	**Digital Control Systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Students will be enabled to develop and analyze control loop structures with discrete-time controllers.
Module content	- Introduction and demands for time-discrete control systems - Mathematical description time-discrete dynamic systems - Time-discrete PID-Controller - Compensating Controller and Deadbeat Controller - state space control
Course type	3L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, lab instruction sheets
Recommended literature	- Lunze, J: Regelungstechnik 2: Mehrgrößensysteme Digitale Regelung, Springer Verlag 1997 - Isermann, R.: Digitale Regelsysteme: Band 1: Grundlagen, deterministische Regelungen, Springer Verlag - Grassmann, H.: Theorie der Regelungstechnik, Verlag Harri Deutsch, Thun/ Frankfurt 1998
Method(s) of instruction/ media being used	lab instruction sheets on the Internet, CAE- Software
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6. term
Compulsory requirements	Basics of control engineering
Recommended requirements	Z-transformation
Assessment	written university exam 90 min
Assessment modalities	PL – during period of exams (graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 70 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 20 h exam preparation
Usability of this module	Usage of module in other study courses: Mechatronics
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.602**
Module name	**Transmission Technique**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - understands the sections of information transmission in space and time - are able to use some major methodes - are able to use math methodes to rate these - are able to identify Parameters of different methodes
Module content	- Information sources, source encoding and decoding - Cryptography - Channel encoding and decoding - Binary Signal Transmission, Line encoding - Bit Error Rate in Case of Biary transmission Signals - 1st and 2nd Nyquist Criterion - Band pass signals and band pass transmission - digital modulation techniques (ASK, PSK, FSK, GMSK, QAM) - Multiplexing technologies
Course type	2L - 0E - 1S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script, exercises and lab instruction sheets on the Internet
Recommended literature	Bossert, M.: Einführung in die Nachrichtentechnik, Oldenbourg Verlag 2012 Ohm, Lüke: Signalübertragung, Springer-Verlag 2005 Rohling, Müller: Einführung in die Informations- und Codierungstheorie, Teubner 1995 Kreß ,Irmer: Angewandte Systemtheorie, Verlag Technik 1989 Kreß: Theoretische Grundlagen der Übertragung digitaler Signale, Akademie-Verlag 1979 Friedrichs: Kanalcodierung, Springer 1996 Schneider-Obermann: Kanalkodierung, Vieweg 1998 Lipp, M.: VPN – virtuelle private Netzwerke, Pearson 2001 oder Addison-Wesley 2001
Method(s) of instruction/ media being used	lecture, exercises, lab sessions and self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Recommended requirements	Signal Processing, Theory of Signals and Systems, Basics of Signal Transformation
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	160h of total work load, thereof 60h of contact hours and 100h of self-study consisting of: 30 h lecture (preparation and rework) 15 h seminar 15 h practical training (preparation and evaluation) 40 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.603**
Module name	**Audio Engineering**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Students are able to measure and interpret parameters for audio transmitting systems, apply methods of digital signal processing to audio signals and develop and test of digital audio filters/effects in MATLAB
Module content	Sound propagation, room acoustics, psychoacoustics, measured variables, microphones and loudspeakers, audio data formats, audio filters, audio effects
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Technical literature, lab instruction sheets
Recommended literature	Udo Zölzer: Digitale Audiotechnik Franz, Dieter: Elektroakustik, Franzis Handbuch Ballou, Glen: Handbook for Sound Engineers, Focal Press, Boston Henle, Hubert: Das Tonstudio Handbuch, GC Carstensen Dickreiter, Michael: Handbuch der Tonstudiotechnik, 1 u. 2, K. G. Saur Pieper, Frank: Das P.A. Handbuch, G.C. Carstensen Görne, Thomas: Mikrofone in Theorie und Praxis, elektor Mellor, David: Recording Techniques for small studios, PC Publishing Export House, Tonbridge Fachzeitschriften “Production Partner”, “Keyboards”
Method(s) of instruction/ media being used	lecture, practical course, use of software ProTools and MATLAB
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6. term
Compulsory requirements	none
Recommended requirements	Analog Circuit Design, Theory of Signals and Systems, Digital Signal Processing
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180 h of total work load, thereof - 60 h of contact hours - 120 h of self-study, consisting of: preparation and rework lecture 40 h exercise - seminar - practical training 50 h (preparation and evaluation) exam preparation 30 h
Usability of this module	Video Technology
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.604**
Module name	**Video Engineering**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr.-Ing. Sebastian Knorr
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student should learn the fundamentals of video signals, coding, and image and video compression formats. Main points are video formats with compression, video production and post production in theory and practice.
Module content	- Video signals: RGB, YUV, Y/C, BAS, FBAS - Video recording and playback - Camera technique and operating: black balance, white balance, electronic shutter, recording technique, illumination - Fundamentals of image and video compression: DCT, quantisation, run-length coding - Video compression: motion estimation and compensation - Image and video formats: JPEG, JPEG2000, DV, MPEG-1, MPEG-2, MPEG-4/H.264 etc. - Post production: Linear and, non-linear editing, assemble, insert, clip, reel, title, graphics, aperture, cut, animation, chroma keying - Streaming video: video server and formats
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Recommended literature	- Ulrich Schmidt: Professionelle Videotechnik,:Springer Vieweg, Berlin [u.a.], 6. Auflage, 2013. - Tilo Strutz: Bilddatenkompression, Vieweg + Teubner, 4. Auflage, 2009 - Thomas Petrasch und Joachim Zinke: Videofilm – Konzeption und Produktion, Hanser-Verlag, 2012.
Method(s) of instruction/ media being used	Scripts and lab instruction sheets on the Internet
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summerterm
Term	6. term
Compulsory requirements	none
Recommended requirements	Theory of Signals and Systems, Computer Sciences, Digital Image Processing
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 40 h lecture (preparation and rework) 40 h practical training (preparation and evaluation) 40 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.605**
Module name	**Microcomputer Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	TI
Module coordinator	Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful completion of the module the students are able to: - understand the working principles and application potential of different processor architectures. - develop and build extension modules at PCB level. - connect extension modules to microcontrollers and write the needed software drivers. - develop microcontroller based systems in a systematic way.
Module content	- Architecture and classification of microprocessors - Programming Model of microprocessors - Memory hierarchy and bus systems - Peripheral Components - Design, manufacturing and use of a microcomputer system
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, lab instruction sheets
Recommended literature	Tanenbaum. Computerarchitektur Pearson Studium 2001 Hermann. Rechnerarchitektur Vieweg 2001 Clements. The Principles of Computer Hardware Oxford 2000
Method(s) of instruction/ media being used	Lecture, lab session
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Recommended requirements	Extended programming skills, basic knowledge of microcontrollers and their programming in C, circuit engineering fundamentals, basic knowledge in PCB design
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The ability to systematically design a microcontroller based system is shown with the documentation of the design steps of a project aiming at designing a relatively complex microcontroller based system.
ECTS credits	6
Workload	180 h of total work load, thereof 60 h of contact hours and 120 h of self-study, consisting of: 40 h lecture (preparation and rework) 50 h practical training (preparation and evaluation) 30 h exam preparation
Usability of this module	Industrial placement, Bachelor thesis
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.606**
Module name	**Intercultural Communication 3 (Foreign Trade)**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba)
Module coordinator	Prof. Dr. rer.oec. Kathrin Reger-Wagner
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Basics of Technical Sales - problem area and topic relevance Development and importance of technical sales , Conditions and challenges under consideration of specific application fields - Systematic Marketing Management as the basis of sales control Specifics of the B-to- B marketing , distribution systems - Organizational and behavioral theoretical foundations Features and explanations for industrial decision-making, business type specification and its peculiarities (system investment business , etc.) - situation analysis , goal and strategy determination Tools of information retrieval , potential analysis , target definition , segmentation and positioning - Technical sales in the application to the customer: The procedural and marketing mix -related application perspective Holistic Process Management , Acquisition, needs identification, proposal design and programming, pricing methods , base camp of the negotiation and sales techniques , customer retention tools - Organizational and staffing requirements of technical sales Sales organization , partnership distribution and interface issues - Controlling in technical sales Basic performance indicators and survey techniques (customer valuation models) Foreign Trade - problem area and topic relevance Development and importance of foreign trade for businesses , conditions and challenges in consideration of current and future developments , - Basics of Foreign Trade International trade and trade policy , distinct from economic issues , internationalization process and basic motives - Strategic Foreign Trade Marketing Environment conditions , intelligence gathering by international market research, formulation of objectives , policy options (manifestations of foreign trade, market selection and market entry , etc.) - Operating Foreign Trade Marketing Decision-making criteria of product adaptation and standardization , product regulations , contracts International pricing policy Foreign trade calculation including procurement issues , payment , international payments International Distribution Forms of transport and international logistics , delivery , documentation of shipments , customs and other import regulations International communication policy Cultural specifics of consumer behavior , communication forms and channels International human resource policies and organizational structure Personnel management in different cultures , organizational architecture and coordination mechanisms - Foreign trade -related Controlling Performance indicators and survey methods - Ethical issues in an international context
Module content	Basics of Technical Sales - problem area and topic relevance Development and importance of technical sales , Conditions and challenges under consideration of specific application fields

	- Systematic Marketing Management as the basis of sales control Specifics of the B-to- B marketing , distribution systems - Organizational and behavioral theoretical foundations Features and explanations for industrial decision-making, business type specification and its peculiarities (system investment business , etc.) - situation analysis , goal and strategy determination Tools of information retrieval , potential analysis , target definition , segmentation and positioning - Technical sales in the application to the customer: The procedural and marketing mix -related application perspective Holistic Process Management , Acquisition, needs identification, proposal design and programming, pricing methods , base camp of the negotiation and sales techniques , customer retention tools - Organizational and staffing requirements of technical sales Sales organization , partnership distribution and interface issues - Controlling in technical sales Basic performance indicators and survey techniques (customer valuation models) Foreign Trade - problem area and topic relevance Development and importance of foreign trade for businesses , conditions and challenges in consideration of current and future developments , - Basics of Foreign Trade International trade and trade policy , distinct from economic issues , internationalization process and basic motives - Strategic Foreign Trade Marketing Environment conditions , intelligence gathering by international market research, formulation of objectives , policy options (manifestations of foreign trade, market selection and market entry , etc.) - Operating Foreign Trade Marketing Decision-making criteria of product adaptation and standardization , product regulations , contracts International pricing policy Foreign trade calculation including procurement issues , payment , international payments International Distribution Forms of transport and international logistics , delivery , documentation of shipments , customs and other import regulations International communication policy Cultural specifics of consumer behavior , communication forms and channels International human resource policies and organizational structure Personnel management in different cultures , organizational architecture and coordination mechanisms - Foreign trade -related Controlling Performance indicators and survey methods - Ethical issues in an international context The students should - be able to absatzgerichtetem thinking with the inclusion of complex cross-border decision-making criteria. - learn what macro-and microeconomic environment factors represent present and future, the central framework for market-oriented technical-oriented companies and how to respond to this on the sales side. - the key elements of foreign trade-related rules in Germany, and know how these are to be considered suitable in sales management. - be able to discuss the ethical aspects of cross-border sales in the context of country-specific economic conditions and the individual business situation is critical. Basics of Technical Sales The students should

	- be able to discuss the specifics of organizational behavior theoretical purchasing behavior and, based on formulating the requirements for an effective sales work . - know which strategic analysis techniques to derive a sales measures available and how to apply it and to be linked with each other. - in terms of a decision-oriented management know the sales strategy alternatives and evaluate them. - can discuss which methods of selling psychology in the B-to -B services are particularly efficient and how they come in specific situations actually used. - be able to respond to technical embossed distribution function in their role as an interface between customers and companies through the use of appropriate instruments. - Key performance indicators to evaluate sales performance compute , interpret and propose appropriate measures for improvement in terms of a holistic sales management. Foreign Trade The students should - having recourse to know the latest trends challenges for cross- border trade and to derive implications for international management . - Can name strategic decision-making criteria of international trade and thereby select appropriate management tools and apply safe. The knowledge is at the center that can not be described solely by international strategies of the tension between globalization and localization. - be able to analyze internationally minded , complex problems , to create appropriate concepts and to present it positively . - can the close relationship between strategy and structure in an international context to understand and classify essential organizational structures and coordination instruments
Course type	1L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	PowerPoint presentations, overhead transparencies, whiteboard, teaching videos, (multimedia) case studies, inclusion of guest speakers
Recommended literature	Jahrmann, F.-U. (akt. Aufl.): Außenhandel. Kompendium der praktischen Betriebswirtschaft, 12. Aufl., Ludwigshafen. Kutschker, M./Schmid, S. (aktl. Aufl.): Internationales Management, 6. Aufl., München. Daniels, J./ Radebaugh, L./ Sullivan, D. (aktl. Aufl.): International Business: Environments and Operations, internationale Ausgabe, 12. Aufl., Upper Saddle River. Ergänzend: Büter, C. (aktl. Aufl.): Außenhandel: Grundlagen globaler und innergemeinschaftlicher Handelsbeziehungen, Heidelberg. Schlick, H. (aktl. Aufl.): Außenhandel. Internationale Handelsgeschäfte, 3. Aufl., Troisdorf. Schmeisser, W./ Krimphove, D. (aktl. Aufl.): Internationales Personalmanagement und Internationales Arbeitsrecht, München. sowie aktuelle Beiträge aus Fachzeitschriften
Method(s) of instruction/ media being used	Problem based learning by simulating practical situations in combination with video-based learning, review of journal articles, English case study Problem based learning based on the discussion of real business problems
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Assessment	seminar paper, case Study, presentation, written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3

Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 35 h lecture (preparation and rework) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.701**
Module name	**Industrial Internship**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Matthias Förster
Compulsory/ optional/ electiv	Compulsory
Learning objectives	In industrial practice, the students should learn engineering activities The students get an insight into the work of an engineer and the technical and social requirements.
Module content	Students will receive practical training on specific projects that correspond to the content of each selected focus of the main study and perform engineering activities independently. The practical training can be done,. B. In the fields of electronics, hardware, and software development as well as for tasks of designing, manufacturing, assembly, testing, production planning, quality assurance in Electrical Engineering / Information Technology.
Course type	(Lecture, Exercises, Seminar, practical course)
Recommended literature	A general bibliographical reference cannot be given because it depends on the topic.
Method(s) of instruction/ media being used	Industrial practice
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	7th term
Compulsory requirements	All examinations of the first to sixth semester up to 3 must be passed. The internship contract between student and company must be approved by the Internship Office of the university.
Assessment	Laboratory internship report, presentation
Assessment modalities	SL - ungraded course work during the lecture period
ECTS credits	12
Workload	12 Weeks = 450 h
Duration of module	12 Weeks
Language	German

Module number	**ET.1.702**
Module name	**bachelor thesis**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to discretely create a scientific report - to determine a scientific problem - to plan and conduct a scientific task to solve a scientific problem - to evaluate a scientic problem
Module content	Scientific report in order to finish the Bachelor Degree. The subject of the Bachelor Thesis may be issued by the university or an external organisation, e. g. an industry company.
Course type	(Lecture, Exercises, Seminar, practical course)
Recommended literature	Scheld, G;Anleitung zur Anfertigung von Praktikums-, Seminar- und Diplomarbeiten sowie Bachelor- und Masterarbeiten
Method(s) of instruction/ media being used	independent editing of the final thesis, review of the literature, interviews with the supervisor of the thesis
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	Winter term
Term	7. term
Compulsory requirements	All compulsory and elective modules, Internship
Assessment	Scientific work
Assessment modalities	Final examination
Further Information	The processing time of the final thesis is 9 weeks and can be extended max. 3 weeks (see §23 PO). The Bachelor's thesis must be submitted to deliver in duplicate together with the theses (6x) a poster (A4) on the main results in the deanery. The poster must be signed by the company supervisor. Please note the opening hours of the dean's office.
ECTS credits	15
Workload	450 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.703**
Module name	**Colloquium**
Department	Electrical Engineering and Information Technology
Degree program	ATITi (Ba), ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able: - to explain a discretely generated scientific report - to defend scientific solutions and results
Module content	Presentation of the Bachelor Thesis, discussion of the scientific results
Course type	(Lecture, Exercises, Seminar, practical course)
Learning Material	Technical literature, patents, special application software, technical manufacturer information
Recommended literature	Leopold-Wildburger; Schütze: Verfassen und Vortragen - wissenschaftliche Arbeiten und Vorträge leicht gemacht. Berlin: Springer, 2002 Franck: Rhetorik für Wissenschaftler - selbstbewusst auftreten, selbstsicher reden. München : Vahlen, 2001 Huth: Duden - Reden gut und richtig halten! -Ratgeber für wirkungsvolles und modernes Reden. Mannheim: Dudenverlag, 2000 Lucas: Überzeugend reden - mehr Erfolg durch richtige Rhetorik. Düsseldorf: Econ-Taschenbuch-Verlag, 1999
Method(s) of instruction/ media being used	Independent scientific work, Presentation
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	Wintersemester
Term	7. Semester
Compulsory requirements	Successful completion of all compulsory modules and selected elective modules of the course, timely submission of the thesis and supervisor reports
Recommended requirements	Grundkenntnisse in Präsentationstechniken und Rhetorik
Assessment	presentation
Assessment modalities	Final Exam
ECTS credits	3
Workload	90 h Preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.900**
Module name	**Elective Modules**
Department	Electrical Engineering and Information Technology
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The concrete learning objectives can be found in the accordant module description.
Module content	The Optional required modules 1 allow a selection of 4 modules (in each case 3 ECTS-credits) according to your interests. The following modules are available: - ET.1.901 Electromagnetic Compatibility (EE/IE) - ET.1.902Power Electronics (Sp.: AE) - ET.1.903 Sensor Technology (Sp.: AE) - ET.1.904 Integrated Circuits(EE/IE) - ET.1.905 Process Measurement Technology(Sp.: AE) - ET.1.906 Electronic Design(Sp.: CMT, CE) - ET.1.907 Automation Objects (Sp.: AE; AE/Iei) - ET.1.908 Selected Sections on Analogue Circuitry(EE/IE, AE/Iei) - ET.1.909 Filter Design (Sp.: CMT, IE) - ET.1.911 Web Design (Sp.: CMT) - ET.1.912 Signal Processors (Sp.: CMT, CE) - ET.1.505 Mobile Computing/ Software-Engineering for mobile Systems (Sp.: CMT) - ET.1.915 Binary Arithmetic Operations(Sp.: CE) - ET.1.916 Stochastics - ET.1.403.1 Introduction in Digital Design (Sp.: CMT) - ET.1.407.1 Introduction in Optoelectronics (Sp.: CE; AE/Iei) - ET.1.601.1 Introduction in Digital Control Systems (Sp.: CE) - ET.1.9XX List tobe continued The concrete module content can be found in the accordant module description.
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winterterm or summer term
Term	5th or 6th term
Compulsory requirements	compulsory modules of 1st to 4th term
ECTS credits	overall min. 12 ECTS
Workload	360 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.901**
Module name	**Electromagnetic Compatibility**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	optional
Learning objectives	Upon completion of the module, students - understand the importance of EMC - are able to explane major relations to law - understand the physical and technical fundamentals of interferences between devices and equipments - know measuring and testing methods - are able to handle some measuring an testing tasks
Module content	- Introduction to Electromagnetic Compatibility - Governmental regulations and standards - Signals and coupling mechanisms, models - EMI measurement, - Checking of EMS - Surroundings for measurement: OATS, (G)TEM Cells, Anechoic chambers, reverberation chambers - Screening properties of materials - Examples for EMC measuring systems - Board design and EMC - (protection of persons in electrical, magnetic and electromagnetic fields)
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script and lab instruction sheets on the Internet
Recommended literature	GOEDBLOED, J. J.: Elektromagnetische Verträglichkeit. München: Pflaum 1990 SCHWAB, A.: Elektromagnetische Verträglichkeit. Berlin, Tokio: Springer 1996 THUMM, WIESBECK, KERN: Hochfrequenzmesstechnik.
Method(s) of instruction/ media being used	Lecture, lab sessions, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5th term
Compulsory requirements	none
Recommended requirements	Basic Measurement Techniques
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 15 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 15 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.902**
Module name	**Power Electronics**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Learning objectives	The students will understand the basic structure, the static behaviour, the switching characteristic and the limits of the devices. This will give them the possibility for the choice and the rating of the elements. They will also know the generic power electronic circuits and their simulation. After successfully participating in this course, students are able to select power electronic devices for spezial power electronics circuits and the students are able to calculate and simulate the behavior of the power electronic circuits.
Module content	The topics of the lecture are - Introduction with an overview of the tasks, the principles and the components of power electronics - Power semiconductor switches with power diodes, power MOSFET and IGBT - Heat transfer, snubber circuits, power modules - Dc-dc switch mode converter with step-down, step up, buck-boost, flyback and forward converters - Application of power electronics (power factor correction) Typical problems like EMC-problems will be explained. In the practical course the students work with the following experiments: - Semiconductor power switch with inductive load - dc-dc converter - simulation of power electronic circuits with SIMPLORER.
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture papers and experiment instructions
Recommended literature	Michel, M: Leistungselektronik Specovius, J.: Grundkurs Leistungselektronik Schröder, D.: Leistungselektronische Bauelemente Schröder, D.: Leistungselektronische Schaltungen
Method(s) of instruction/ media being used	lecture and experiment
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Electronic Components, Electrical Drives
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 25 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.903**
Module name	**Sensor Technology**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	AT
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	The students acquire knowledge of the operating conditions of sensoric basic components. This enables them to design and develop simple sensoric assemblies and systems. Due to the intensive study of the basics of sensor technology, graduates are able to familiarize themselves with new tasks in sensor system development at short notice.
Module content	Physical and technological basics and applications of modern electronic and optoelectronic sensors
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture transparencies, lab instruction sheets (on the internet)
Recommended literature	H.-R. Tränkler, E. Obermeier (Herausg.) "Sensortechnik" Handbuch für Praxis und Wissenschaft, Springer-Verlag 1998 W. Heiwang (Herausg.) "Sensorik", Reihe: Halbleiter-Elektronik Bd. 17, Springer-Verlag 1993 (4. Auflage) P. Hauptmann "Sensoren: Prinzipien und Anwendungen" C. Hanser-Verlag München, Wien 1990
Method(s) of instruction/ media being used	lecture, practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer or winter term
Term	5th or 6th term
Compulsory requirements	none
Recommended requirements	Basic knowledge in Physics, Microtechnology and Optoelectronics, Basic Measurement Techniques
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Master programme Scientific Instrumentation (sub-modules)
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.904**
Module name	**Integrated Circuits**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	optional
Learning objectives	The student will be introduced to the design of integrated analog circuits. The constructive understanding of circuits, the assessment of structural alternatives and the dimensioning of integrated bipolar circuits is emphasized. The students will be familiar with integrated analog function blocks and their application. At the end of the module students are able to understand the principle of operation of almost any complex integrated subcircuit on the basis of the knowledge about the basic and elementary circuit configurations and there characteristics. The students are able to adapt integrated subcircuits to different semiconductor technologies.
Module content	- Construction principles for integrated analog circuits (degrees of freedom, composability, basic principles of circuitry, realisation principles of circuitry); - analysis of electrical networks, functional analysis, symbolic analysis and empiric sizing methods; - basic circuit configurations, negative feedback and its principle effects; - elementary circuits, there properties and application requirements; - circuit technology of integrated analog function blocks (which typical quality parameters characterise the function block? Which basic principles can be chosen? What does the most simple realisation of the basic principles look like? Which circuit principles are used to increase the performance?); - systemisation of circuit principles.
Course type	2L - 0E - 1S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lecture notes, exercises, examples
Recommended literature	Hering, E.,K. Bressler und J. Gutekunst: Elektronik für Ingenieure. Springer Verlag, 1998. Tietze, U. und C. Schenk: Halbleiterschaltungstechnik. Springer Verlag, 2002. Köstner und Möschwitzer: Elektronische Schaltungstechnik. Hanser Verlag, 1993. Goerth, J.: Bauelemente und Grundschaltungen. Teubner-Verlag, 1999. Lindner, Brauer und Lehmann: Elektrotechnik — Elektronik. Fachbuchverlag, Leipzig, 1998. Koss, G. und W. Reinhold: Lehr- und Übungsbuch Elektronik. Fachbuchverlag Leipzig, 1998. Seifahrt: Analoge Schaltungen und Schaltkreise. Verlag Technik, Berlin, 2001. Hartl, H., E. Krasser, G.Winkler et al.: Elektronische Schaltungstechnik mit Beispielen in PSpice. Pearson Studium, München, 2008. Riedel, F.: MOS-Analogtechnik. Akademischer Verlag, Berlin, 1988. Allen, P. E. and D. R. Holberg: CMOS analog circuit design. Oxford University Press, New York, 2002.
Method(s) of instruction/ media being used	Talk, peer instruction, individual work, case study, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term, winter term
Term	5. or 6. term
Compulsory requirements	none
Recommended requirements	Electrical Engineering I and II, Electronic Components, Signals and Systems, Analog Circuit Design
Assessment	exam 75 min
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework)

	0 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Applicable in the Master Courses SD: Module Integration of mixed-signal circuits , Module Analog Design
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.905**
Module name	**Process Measurement Technology**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	AT
Module coordinator	Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	optional
Learning objectives	After students have attended the course, they are able to - interpret a task for industrial measurement of non-electrical quantities, - generalize the task, - compare different industrial solutions, - select devices taking into account their application limits, - demonstrate solutions on commonly used systems
Module content	basic elements of a measuring device; measurement inaccurac; measurement of the following dimension: - temperature - compression, fortitude - discharge - charging level, limit state, distance - analysis - humidity
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Script, lab instruction sheets, extracts of standards
Recommended literature	- Hesse, S. u.a.: Sensoren für die Prozess- und Fabrikautomation; Wiesbaden: Vieweg + Teubner - Hoffmann, J.: Taschenbuch der Messtechnik; Leipzig: Fachbuchverlag - Prock, J.: Einführung in die Prozessmesstechnik B.G. Teubner-Verlag, Stuttgart
Method(s) of instruction/ media being used	Team work, reflections in the plenum, lab sessions
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term or winter term
Term	5th or 6th term
Compulsory requirements	none
Assessment	Laboratory internship certificate, seminar paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 25 h lecture (preparation and rework) 10 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.906**
Module name	**Electronic Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT, TI
Module coordinator	Prof. Dr. Detlef Redlich
Compulsory/ optional/ electiv	optional
Learning objectives	Basic knowledge of technical representation of electronic components using CAD are to be taught. Students can apply the aquired knowlage to PCB design.
Module content	- technical illustrations in electronics - technical illustrations of mechatronical devices with 3D CAD Software - Simulation of electronic devices with FEM tools
Course type	1L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Will be announced during the lecture.
Recommended literature	1.Fucke, Rudolf; Kirch, Konrad; Nickel, Heinz: Darstellende Geometrie für Ingenieure, Carl Hanser 2004, ISBN 3-446-22723-7 2.Vogel, Harald: Einstieg in CAD; Hanser, München und Wien, 2004; ISBN 3-446-22381-9
Method(s) of instruction/ media being used	Lecture and practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer or winter term
Term	5th or 6th term
Compulsory requirements	none
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 15 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.907**
Module name	**Automation Objects**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	optional
Learning objectives	The students are able to design controls for basic applications in process engineering and to calculate the related actuators.
Module content	- Technological process and automation - Summary to select chapters of the process measurement technique and actuating technique - Multi-loop control structures - General arithmetic circuit - base control conceptions for technical systems (basis operations).
Course type	2L - 0E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script
Recommended literature	- Strohrmann, G.: Automatisierung verfahrenstechnischer Prozesse, R. Oldenbourg-Verlag, München/Wien 2002 - Breckner, K.: Regel- und Rechenschaltungen in der Prozessautomatisierung, R. Oldenbourg-Verlag, München/Wien 1999 - Gevatter, H.-J.; u.a.: Handbuch der Mess- und Automatisierungstechnik, Springer-Verlag, Berlin/Heidelberg 1999
Method(s) of instruction/ media being used	Lecture with practical course
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter or summer term
Term	5. or 6. term
Compulsory requirements	none
Recommended requirements	Automatic Control
Assessment	term paper
Assessment modalities	APL - alternative exam during period of lectures (graded)
ECTS credits	3
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 35 h lecture (preparation and rework) 25 h exam preparation
Usability of this module	-
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.908**
Module name	**Selected Sections on Analogue Circuitry**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba), ME (Ba)
Module coordinator	Prof. Dr.-Ing. Thomas Reuter
Compulsory/ optional/ electiv	optional
Learning objectives	The student should familiarise with special analog circuit organisation and get to know possible applications of operational amplifiers. The main aim if the knowledge of methods for circuit analysis and synthesis.
Module content	Multiplier, negative-inpedance-converters, gyrators, lock-in amplifier, phase detector, voltage controlled oscillator, phase-locked loop, dc- supply, analog filters
Course type	0L - 0E - 2S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	exercises, lab instruction sheets
Recommended literature	- Tietze. U.; Schenk. C.: Halbleiterschaltungstechnik - Bystron/Borgmeyer: Grundlagen der technischen Elektronik - Morgenstern, B: Elektronik, Band II: Schaltungen
Method(s) of instruction/ media being used	Lecture: work on the blackboard, Tutorial exercises experiments at the laboratory after instruction with written preparations
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6th term
Compulsory requirements	none
Recommended requirements	Electrical Engineering 1 and 2, Mathematics, Electronic Components, Electronics
Assessment	Laboratory internship certificate, Laboratory internship report
Assessment modalities	SL - ungraded course work during the lecture period
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	Master ET/IT, RE und ME
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.909**
Module name	**Filter Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students are able to choose an adequate filter technology for a given filter problem and to find an optimal problem solution.
Module content	Types of filters and applications - analysis of filters in s- and z-domain - analog filter design by standard approximations - design of digital FIR-filters - design of digital IIR-filters - digital filter realizations
Course type	1L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture scripts, textbooks, tasks and solutions, software MATLAB
Recommended literature	- Achenbach, J.-J.: System-Synthese, VDI-Verlag - Achenbach, J.-J.: Analoge und digitale Filter und Systeme (Band 1: Grundlagen), BI-Wissenschaftsverlag - Achenbach, J.-J.: Analoge und digitale Filter und Systeme (Band 2: Übungsaufgaben mit Lösungen), BI-Wissenschaftsverlag
Method(s) of instruction/ media being used	simulations by software tool MATLAB/SIMULINK
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	5. term
Compulsory requirements	none
Recommended requirements	Mathematics, Basics of Electrical Engineering, Basics of Computer Science, Theory of Signals and Systems, Digital Signal Processing, Analog and Digital Circuit Design
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90 h of total work load, thereof - 45h of contact hours and - 45h of self-study, consisting of: preparation and rework lecture 4 h exercise 4 h practical training 2 h (preparation and evaluation) exam preparation 35 h
Usability of this module	Control engineering, measurement technology, audio and video processing, communication technology, computer sciences and signal processors
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.911**
Module name	**Web Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	optional
Learning objectives	Upon completion of the module, students - are able to use fundamental methods to build simple web pages - are able to implement user interactions - are able to use methodes for efficient formatting - understands the importance of design rules for good useability
Module content	Introduction HTML, HTTP and URL MS Expression Web4: Production of HTML-based Internet sites (layout, CSS, navigation) Interactive Internet site (using PHP) Introduction Author systems - environment for interactive Multimediaprojekte and Rich Internet Applications interactive multimedia and learning aid, means of publicity, banner, Internet shop, interactive instructional films
Course type	1L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script and lab instruction sheets on the internet
Recommended literature	WorldWideWeb-Consortium http://www.w3.org/ Seimert, W.: Microsoft Expression Web, Franzis Verlag 2008 Münz, S.: Professionelle Websites. Addison-Wesley, 2005 Agular, R.: HTML und CSS, mitp 2008
Method(s) of instruction/ media being used	Interactive lecture, practical course, team work in small groups, self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer or winter term
Term	5th or 6th term
Compulsory requirements	none
Recommended requirements	Basics of Programming, Algorithms and data structures
Assessment	Laboratory internship certificate, colloquium, web site
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 15 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.912**
Module name	**Digital Signal Processors**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba)
Specialization/ Profil	KMT, TI
Module coordinator	Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	optional
Learning objectives	After successful completion of the module the students are able to: - understand the working principles and typical fields of application of digital signal processors - evaluate signal processing algorithms regarding their suitability to solve a given problem - adopt the algorithms to suit the given problem and implement them on a digital signal processor - implement fixed point arithmetics in a digital signal processor
Module content	- Architecture of DSP micro processors - Implementation of signal processing algorithms on a digital signal processor in Assembler and C - Analysis and optimization of program runtime - Influence of characteristics of signal processing algorithms on the architecture of digital signal processors
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script, Lab instruction sheets
Recommended literature	Smith, Steven W.: „The Scientist and Engineer's Guide to Digital Signal Processing“. California Technical Publishing, 1997
Method(s) of instruction/ media being used	Interactive lecture, practical course, work in little teams, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term or winter term
Term	5th or 6th term
Compulsory requirements	none
Recommended requirements	Programming skills, knowledge of programming language C, basic knowledge in signal and system theory, basic skills in programming microcontrollers
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The ability to chose suitable digital signal processing algorithms for a given problem, to modify the chosen algorithm and to implement it on a DSP is proven by the documentation of the results of a project.
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of work on an individually assigned project
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.915**
Module name	**Binary Arithmetic Operations**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Specialization/ Profil	EAT, TI, KMT
Compulsory/ optional/ electiv	optional
Learning objectives	Learning of methods for digital realization of arithmetic operations in real-time applications. These operations represent base elements of complex algorithms implemented in digital hardware (discrete circuit design, programmable logic, application-specific integrated circuit design) and real-time software (programming of digital signal processors).
Module content	Number conversation – Carry-look-ahead adders – Carry-save multioperand adders – Fast incrementers – Overflow detection and correction – Saturation adders – Hardware emulation by means of modulo-operations - Add-shift multipliers and array multipliers – Canonical sign-digit operand representation for constant factors
Course type	2L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture scripts, tasks and solutions
Recommended literature	Hwang, K.: Computer Arithmetic Waser, S.; Flynn, M.: Introduction to Arithmetic for Digital Systems Designers Jorke, G.; Lampe, B.; Wengel, N.: Arithmetische Algorithmen der Mikrorechentechnik
Method(s) of instruction/ media being used	lectures, exercises, self-study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6. term
Compulsory requirements	none
Recommended requirements	Basics of Computer Science, Digital Circuit Design
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90 h of total work load, thereof - 45 h of contact hours and - 45 h of self-study, consisting of: preparation and rework lecture 20 h exercise 10 h exam preparation 15 h
Usability of this module	Usable for modules containing applications which take use of digital arithmetic operations, such as signal processors, microcomputer engineering, programmable logic, digital integrated circuit design, digital control engineering, digital filter design, audio and video technology and digital transmission technology.
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.916**
Module name	**Stochastics**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ba), ATITi (Ba)
Module coordinator	Prof. Dr. Mario Walther
Compulsory/ optional/ electiv	optional
Learning objectives	- Fundamentals of probabilities - Confidence limits and tests for normal and binomial distributions - Experimental design - Nonparametric methods - Mathematical techniques and methods which are important for solving linear and nonlinear optimization problems - Using statistical toolboxes of MATLAB, R or Python
Module content	Probability, Random variables, Distributions, Limit theorems Confidence limits, Parametric significance tests Nonparametric methods for location measures and proportions, Testing goodness of fit and independence
Course type	2L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Script for lecture, additional transparencies, exercises with solutions, worksheets
Recommended literature	Fahrmeir, L. u.a. Statistik, Springer 2003 Kühlmeyer, M., Statistische Auswertungsmethoden für Ingenieure, Springer 2001 Kähler, W., Statistische Datenanalyse, Vieweg+Teubner, 2010 Beichelt, Stochastik für Ingenieure Beucher, O., Wahrscheinlichkeitsrechnung und Statistik mit MATLAB, Springer 2007 Papula, L. Mathematik für Ingenieure, Bd. 3, Vieweg
Method(s) of instruction/ media being used	Lecture and tutorial for deepening the material dealt with in the lecture and discussion on tasks given for individual work. Solving tasks using MATLAB (Optimization Toolbox)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	6st term
Recommended requirements	Mathematics 1 and Mathematics 2
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 75 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 25 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.1.917**
Module name	**Project Autonomous Model Vehicle**
Department	Electrical Engineering and Information Technology
Module coordinator	Prof. Voß (ET/IT), Prof. Dienerowitz (SciTec)
Compulsory/ optional/ electiv	optional
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Compulsory requirements	none
Assessment	project
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.101**
Module name	**Theoretical Information Sciences**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma),ET/IT (Ma)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Electiv
Learning objectives	At the end of the module students are able: - to assess the Chomsky-Hierarchy of formal languages - to assess the concept of computability - to distinguish complexty classes - to aply logic calculus, specifically the resolution calculus - to construct concurrent systems using Petri-Nets
Module content	Theoretical Foundations of Computer Science, Automata Theory, Formal Languages, Graph Theory, Complexity Theory, Logic Calculus, Computability, Decidability
Course type	0L - 0E - 3S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature recommendation specific to the seminar sessions
Recommended literature	- John E. Hopcroft, Rajeev Motwani, Jerey D. Ullman: Einführung in Automatentheorie, Formale Sprachen und Berechenbarkeit, 3., aktualisierte Au age, Pearson Studium 2011. - Dirk W. Hoffmann: Theoretische Informatik, Hanser, 2009. - Michael Sipser: Introduction to the Theory of Computation, 3rd Edition, Cengage Learning 2013. - Michael Schenke: Logikkalk□ule in der Informatik: Wie wird Logik vom Rechner genutzt?, Springer 2013. - Wolfgang Reisig: Petrinetze: Modellierungstechnik, Analysemethoden,Fallstudien, Vieweg 2010.
Method(s) of instruction/ media being used	Seminar, Exercisises
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Computer science basic knowledge, programming skills in at least one common programming language, basic knowledge in discrete mathematics
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to prepare a report according to one of the session topics
ECTS credits	6
Workload	180h of total work load, thereof 45h of contact hours and 135h of self-study, consisting of: 100 h lecture (preparation and rework) 35 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.102**
Module name	**Software Engineering**
Department	Electrical Engineering and Information Technology
Degree program	ET/ IT (Ma)
Module coordinator	Prof. Dr.-Ing. Oliver Jack
Compulsory/ optional/ electiv	Electiv
Learning objectives	At the end of the module students are able: - to apply methods for model-based software development - to apply requirements analysis and system design methods using UML to selected application examples - to assess an object-oriented system design - to plan a software development project
Module content	Model based software development, Unified Modelling Language, Application modelling, Class and state modelling, Modelling of system dynamics
Course type	(Lecture, Exercises, Seminar, practical course)
Recommended literature	- Helmut Balzert. Lehrbuch der Objektmodellierung - Analyse und Entwurf. Spektrum Akademischer Verlag, Heidelberg Berlin, 2. edition, 2004. - Helmut Balzert. Lehrbuch der Software-Technik, Band 1. Software Entwicklung. Spektrum Akademischer Verlag, Heidelberg Berlin, 2. Aufl., 2000. - Wolfgang Zuser, Thomas Grechenig, and Monika Köhle. Software-Engineering mit UML und dem Unified Process. Pearson Studium, München [u.a.], 2., überarb. Aufl., 2004. - Harald Störrle. UML2 für Studenten. Pearson Studium, München [u.a.], 2005.
Method(s) of instruction/ media being used	2L - 0E - 0S - 2P
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	Computer Science, Software Engineering
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The students have to conduct an extensive software design project.
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 50 h lecture (preparation and rework) 45 h practical training (preparation and evaluation) 25 h exam preparation
Usability of this module	Embedded Systems
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.104**
Module name	**Reliability Theory**
Department	Electrical Engineering and Information Technology
Degree program	ETIT (Ma), RFE (Ma), ME (Ma)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	optional
Learning objectives	Learning of basics and methods for reliability of complex technical systems.
Module content	Introduction and terms of reliability – mathematical basics and parameters – analysis and proof of reliability – mean time to failure – development of model and planning of reliability – series-, parallel- and mixed series-parallel-systems – parallel systems with hot and cold redundancy – exemplary solutions for reliability of circuit components, devices and systems
Course type	(Lecture, Exercises, Seminar, practical course)
Recommended literature	Meyna, A.; Pauli, B.: Taschenbuch der Zuverlässigkeits- und Sicherheitstechnik, C. Hanser Verlag, München/Wien, 2003 Birolini, A.: Zuverlässigkeit von Geräten und Systemen, Springer- Verlag, Berlin/Heidelberg, 4. Auflage, 1997 Deutsche Gesellschaft für Qualität: Zuverlässigkeit komplexer Systeme aus Hardware und Software, DGQ- Band 17-01, Frankfurt/M., 1998
Method(s) of instruction/ media being used	2L - 1E - 0S - 0P
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	Mathematics
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90 h of total work load, thereof - 45 h of contact hours and - 45 h of self-study, consisting of: preparation and rework lecture 15 h exercise 15 h exam preparation 15 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.105**
Module name	**Analog Design**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student will be familiarized with the design of integrated analog circuits. The basic steps for the design of integrated circuits, the constructive understanding of circuits as well as the evaluation of structure alternatives for complex integrated bipolar circuits are emphasized. At the end of the module students are able to use behavioural and structural models on different levels of abstraction and to rate them. The students understand the principle of operation of a phase-locked loop and they are able to evaluate the PLLs properties. The students are able to evaluate and choose the best component implementation and to adopt it to a given application. For this purpose, the students are able to recognise basic principles of circuitry and to understand there principles of operation. The students are able to apply methods for analysis and sizing of linear and non-linear analog circuits.
Module content	- Systematisation of the design development, traditional and top-down design methodology for mixed-signal systems, structural synthesis for analog circuits, modelling on different levels of abstraction; - PLL principles of operation, abstract modeling schemata, and applications; - non-linear circuitry for integrated analog systems, integrated analog functional blocks and their usage for PLL applications (regulated and unregulated amplifiers,phase detektors, oscillators and VCO).
Course type	2L - 0E - 2S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lecture notes, seminar exercises, laboratory instructions
Recommended literature	- Tietze, U.; Schenk, C.: Halbleiterschaltungstechnik. - Meier, U.; Nerreter, W.: Analoge Schaltungen: Entwurf, Berechnung und Simulation. - Baker, R.J.: Mixed-signal circuit design. - Kurz, C.; Mathis, W.: Oszillatoren. - Best, R.: Theorie und Anwendung des Phase-locked Loops
Method(s) of instruction/ media being used	Talk, individual work, case study, hands-on training, self-study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer, winter
Term	1. term
Compulsory requirements	none
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 70 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 15 h exam preparation
Usability of this module	Integration of mixed-signal circuits, Complex Lab Session, IC-Design, Masterarbeit
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	twice a year
Language	German

Module number	**ET.2.106**
Module name	**Electromagnetic Fields**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Module coordinator	Prof. Dr.-Ing. Martin Hoffmann
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The students acquire advanced and applicable knowledge at electromagnetic fields. They are able to solve the Maxwell equations for selected field problems. They have learned different strategies to solve electromagnetic problems and can apply these practically. Students are familiar with ANSYS Maxwell analysis software for the simulation of electromagnetic fields and can apply them.
Module content	The lecture teaches basic strategies and tools for the treatment of electrical and magnetic field systems: - Maxwell equations in differential and integral form - static electric and magnetic fields - scalar fields / vector fields - mirroring method, field analogies - boundary value problem, material properties - dynamic electromagnetic fields, electromagnetic waves - wave propagation in conductive medium - wave propagation in waveguides - FEM analysis of electrical and magnetical problems
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lab instruction sheets, handouts
Recommended literature	Recommended literature will be announced in the lecture.
Method(s) of instruction/ media being used	lecture, practical course, self-study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	Electrical Engineering 1/2, Analysis 1/2, Physiks
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL - test performance (graded) APL - certificate (nongraded)
ECTS credits	6
Workload	180h of total work load, thereof - 60h of contact hours and - 120h of self-study, consisting of: - 35h lecture (preparation and rework) - 35h practical training (preparation and evaluation) - 50h exam preparation
Usability of this module	Complex Lab Session, Design of Electronic Systems, Applied Actuators
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.107**
Module name	**Servo Drive Systems and Components**
Department	Electrical Engineering and Information Technology
Degree program	Me (Ma), RFE (Ma), ET/IT (Ma)
Specialization/ Profil	Automation Technology
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	elective
Learning objectives	Based on the basics of electric machines and field-oriented control, in-depth mathematical and systemic knowledge of the control and control of electric drives will be imparted. Additionally the communication – and control possibilities for electric drives are to be learned. After successfully participating in this course, students are able to develop, design and simulate an electric drive with a wide variety of types of control.
Module content	The topics of the lecture are - Introduction and describtion of electrival drive systems - repeat the construction and operation of dc- and ac- motors - mathematical description of DC- and AC-machines (especially with field-oriented control) - calculation and description of speed- and positioncontrol - introduction into the control- and commmunication technology of electrical drives In the practical course the students work with the following experiments: - Simulation of DC- and AC-machines - Positioning System - Drive control
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture papers and experiment instructions
Recommended literature	Brosch, P.: Antriebspraxis Schulze, M.:Elektrische Servoantriebe Schröder, D.: Elektrische Antriebe – Regelung von Antriebssystemen
Method(s) of instruction/ media being used	lecture and experiment
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	Electrical Drives
Assessment	exam 60 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 35h lecture (preparation and rework) 60 h practical training (preparation and evaluation) 25 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.110**
Module name	**Nontechnical elective modules**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma), RFE (Ma), Me (Ma)
Compulsory/ optional/ electiv	optional
Module content	The Nontechnical elective modules (3 ECTS-credits) allow a selection of 1 module according to your interests. These modules are available: ET.2.112 – Industrial Property ET.2.113 – English for Specific Purposes ET.2.114 – Business administration compulsory lesson You can find the concrete module content in the relevant module description.
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term or winter term
Term	1st or 2nd term
Compulsory requirements	none
ECTS credits	3
Workload	90 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.112**
Module name	**Industrial Property**
Department	Business Administration
Degree program	Industrial Property
Module coordinator	Prof. Dr. Enders, Prof. Dr. Görg
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The module " Intellectual Property " has the following objectives : - learning to identify all necessary strategic decisions on Intellectual PropertyLegal; - The intellectual property rights as private rights subjective to distinguish absolute rights and intellectual property rights ; - Main features of the international intellectual property capture , in particular between ubiquity , territoriality , protection principle of the country , the country of origin principle and country of origin principle to differentiate ; - Key international agreements such as the ParisConvention and the TRIPS Agreement and theirknow practical application ; - Learn the similarities and the differences between patent and utility model law ; - Elaboration of the principles of design right, theCopyright law, trademark law , as well as important aspects ofLaw of unfair competition ; - Practical application of the claims and their enforcements from the different intellectual property rights.
Module content	Subject of the event is industrial property law which surrounds the strategic IP management with the individual areas of patent law, utility models, design rights and copyright. The economic dimension on the one hand and the right of personality on the other hand worked out. The importance of individual rights is illustrated by concrete examples in the case of tension between investment protection and an obstacle to investment.
Course type	0L - 0E - 2S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	- Enders, T.: Gewerblicher Rechtsschutz, Urheber- und Medienrecht, neueste Auflage; - Enders, T.: Produkteinführung und Gewerbliche Schutzrechte, in: Steckler, - B./Pepels, W.: Handbuch für Rechtsfragen im Unternehmen, Berlin: neueste Auflage; - Ensthaler, J.: Gewerblicher Rechtsschutz und Urheberrecht, neueste Auflage.
Method(s) of instruction/ media being used	Seminar with case studies
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term or winter term
Term	1st or 2nd term
Compulsory requirements	none
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 30h of contact hours and 60h of self-study, consisting of: 40 h lecture (preparation and rework) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.113**
Module name	**English for Specific Purposes**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma), ME (Ma)
Module coordinator	Herr Ulrich Schuhknecht
Compulsory/ optional/ electiv	optional
Learning objectives	The students are enabled to participate actively in meetings and discussions on study and work-related topics. This involves giving information and explaining, expressing opinions and reacting appropriately. They develop their writing skills relating to study and work-related text types, e.g. summaries, reports and abstracts. They are able to listen to lectures for gist and detail and to use the information gathered in follow-up speaking and writing activities. They acquire business-related vocabulary and language skills relevant for engineers. The course is set at level C1 of the Common European Framework.
Module content	- Meetings and discussions on study and work-related topics, e.g. research projects - Listening to lectures in English - Negotiations - Project work - Scientific texts and articles taken from journals, books and the internet as input for writing tasks - Business English for engineers, e.g. company structure, start-ups, financial matters, marketing
Course type	0L - 3E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Reader
Recommended literature	- Dunn, M. et al: English for Electrical Engineering in Higher Education Studies. Garnet Education, 2014 - Hughes, J.: Successful Meetings. OUP, 2013 - Billet, D.: Technical Writing Today. Media Corporation, 2005 - Armer: Cambridge English for Scientists. CUP, 2011 - Engine. EnglischfürIngenieure, Weka Business Medien - Inch. Technical English inch by inch. Matthias Meier Verlag - Research EU. Results Magazine. EU publications - Cotton, D. et al: Market Leader Upper Intermediate. Longman, 2011
Method(s) of instruction/ media being used	Interactive, audio and video recordings, e-learning platform
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Recommended requirements	Successful completion of the module “Technical English” or equivalent (Level B2 of the Common European Framework)
Assessment	oral exam, written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 35 h lecture (preparation and rework) 0 h practical training (preparation and evaluation) 10 h exam preparation
Usability of this module	All study programmes containing a C1 level ESP module
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German/ English

Module number	**ET.2.114**
Module name	**Business Administration for Master Engineers**
Department	Business Administration
Degree program	RFE (Ma), ET/IT (Ma)
Module coordinator	Fachbereich Betriebswirtschaft, Department Business Administration
Compulsory/ optional/ electiv	optional
Course type	2L - 0E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.116, ME.2.110**
Module name	**thermal simulation**
Department	Electrical Engineering and Information Technology
Degree program	Me (Ma)
Module coordinator	Prof. Dr. Detlef Redlich
Compulsory/ optional/ electiv	Compulsory
Course type	01L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	script
Recommended literature	Sergent, J. E. et al.: Thermal Management Handbook: For Electronic Assemblies (Electronic Packaging and Interconnection Series). McGraw-Hill Education 1998 VDI-Wärmeatlas. Berlin: Springer Verlag 1997 G. Müller: FEM für Praktiker, Bd. 1: Grundlagen; expert-Verlag U. Stelzmann: FEM für Praktiker, Bd. 2: Strukturdynamik; expert-Verlag C. Groth: FEM für Praktiker, Bd. 3: Temperaturfelder; expert-Verlag C.C. Spyrakos: Finite Element Modeling in Engineering Practice; Algor Publishing Division, Pittsburgh C.C. Spyrakos: Linear and nonlinear Finite Element Modeling; Algor Publishing Division, Pittsburgh
Method(s) of instruction/ media being used	Lecture and practical course
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	2nd term
Compulsory requirements	none
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.120**
Module name	**Optimal control**
Department	Electrical Engineering and Information Technology
Degree program	Me (Ma), RFE (Ma)
Specialization/ Profil	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	optional
Learning objectives	The students have a basic understanding of the optimal control of physical processes. The students are able to design simple optimal control systems.
Module content	- parameteroptimization and structure optimization - quality criterions - basic principle of the variational calculus - Euler-Lagrange equation - maximum principle of Pontryagin
Course type	1L - 1E - 1S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	- graphical material of the lecture - transformation table - excercises
Recommended literature	H. Gassmann, (1998) Theorie der Regelungstechnik, Verlag Harry Deutsch O. Föllinger (1994) Optimale Regelung und Steuerung, Oldenbourg Verlag
Method(s) of instruction/ media being used	lecture, excercise, blackboard and graphical material via data projector
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	- basics of control engineering and systems theory - differential and integral calculus - state space representation - partial derivatives
Assessment	written university exam 90 min
Assessment modalities	PL – during period of exams (graded)
ECTS credits	6
Workload	180h of total work load, thereof 45h of contact hours and 135h of self-study, consisting of: 115 h lecture (preparation and rework) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.121**
Module name	**Design of Spaceborne Electronics**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma)
Module coordinator	Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful completion of the module the students are able to: - understand a given requirement specification - develop electronics in consideration of the environmental conditions of space applications - complete the required analyses - create the required documentation
Module content	- Special requirements for electronic circuits targeted to space application - Selection of electronic components - redundancy concepts - EMC- centric Design - Verification and test requirements - Special requirements for the design of electronic circuits targeted to space application – required analyses - Radiation analysis - Risk and failure analysis - Derating analysis -Worst-Case analysis
Course type	0L - 0E - 2S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture slides are provided via the Internet.
Recommended literature	The Space Environment by Alan C. Tribble Electronics System Design Techniques for Safety Critical Applications by Luca Sterpone Spacecraft Thermal Control Handbook by David G. Gilmore The Design of an Efficient, Elegant, and Cubic Pico-satellite Electronics System by Christopher Alan Day
Method(s) of instruction/ media being used	Seminar
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	Knowledge in analog and digital circuit design checked via the admission process to the master course
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The ability to systematically design an electronic circuit for use in a space application is shown with the documentation of a design project. The project results have to get defended in a design review.
ECTS credits	6
Workload	180 h of total work load, thereof 60 h of contact hours and 12 0h of self-study, consisting of: 45 h lecture (preparation and rework) 45 h practical training (preparation and evaluation) 30 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.122**
Module name	**Space Travel Systems**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma)
Module coordinator	Prof. Dr.-Ing. Burkart Voß, Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	Compulsory
Learning objectives	use the terminology specific for space problems. Analysis and solution of problems to the position and location change of spacecraft understand the behaviour of satellites (orbits, fuel needs, etc.)
Module content	Orbital mechanics Environmental space conditions Introduction to remote sensing of the earth Mathematical modeling of orbit perturbations Coordinate systems Mathematical attitude description Sensors and actuators for attitude control
Course type	0L - 0E - 3S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	Seminar slides (in English) are provided via the Internet.
Recommended literature	H. J. Kramer: „Observation of the Earth and Its Environment – Survey of Missions and Sensors“ Springer 2002 W. Steiner und M. Schagerl: „Raumflugmechanik – Dynamik und Steuerung von Raumfahrzeugen“ Springer 2004 W. Hallmann und W. Ley et al.: „Handbuch Raumfahrttechnik“ Hanser 1999 J. R. Wertz: “Spacecraft Attitude Determination and Control” Kluwer Academic Publishers
Method(s) of instruction/ media being used	Black board, data projector and simulation software
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	none
Assessment	oral exam - 30 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study.
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.200**
Module name	**Numerical Mathematics/Optimization**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma), Me (Ma)
Module coordinator	Prof. Dr. Christopher Schneider
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Mathematical techniques and methods which are important for solving linear and nonlinear optimization problems and problems of optimal control.
Module content	Linear programming, duality in linear programming, nonlinear optimization, Karush-Kuhn-Tucker-theory, case studies on optimal control, models, Hamilton function, maximum principle, numerical methods for solving optimization problems and problems of optimal control
Course type	3L - 1E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Exercises with solutions, worksheets
Recommended literature	- Schwarz, H.R.;Köckler, N.(2011): Numerische Mathematik. 8. Aufl., Springer Vieweg Verlag. - Alt, Walter(2011): Nichtlineare Optimierung. 2. Aufl., Vieweg Verlag. - Alt, Walter(2013): EAGLE-STARTHILFE, Optimale Steuerung, Theorie und numerische Verfahren, Edition am Gutenbergplatz Leipzig,1. Aufl. - Zimmermann, H.-J.(2008) : Operations Research, 2. Aufl., Vieweg Verlag. - Unbehauen, H.(2011) : Regelungstechnik III, 7. Aufl., Identifikation, Adaption, Optimierung, Vieweg Verlag.
Method(s) of instruction/ media being used	Lecture and tutorial for deepening the material dealt with in the lecture and discussion on tasks given for individual work. Solving tasks using MATLAB (Optimization Toolbox)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Linear algebra, differential and integral calculus for functions of several variables, differential equations, basic knowledge of MATLAB
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof 75h of contact hours and 105h of self-study, consisting of: 60 h lecture (preparation and rework) 25 h practical training (preparation and evaluation) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.201**
Module name	**Satellite communication**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma)
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Upon completion of the module, students - understands special characteristics of telecommunication in case of satellite systems - are able to use relevant standards - understands the sections of information transmission - are able to use selected methodes for information transmission - are able to calculate radio links between earth and satellite
Module content	Special conditions for telecommunication between earth and space Relevant groups of standards Selected parts from the fields of communication networks, RF techniques and information and coding theory
Course type	0L - 0E - 2S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Books, script, exercises and lab instruction sheets on the internet
Recommended literature	Ernst Messerschmid, Stefanos Fasoulas: Raumfahrtsysteme, Springer 2008 Werner Mansfeld: Satellitenortung und Navigation, Vieweg+Teubner Verlag 2003 Bossert, M.: Einführung in die Nachrichtentechnik, Oldenbourg Verlag 2012 Hermann Weidenfeller, Anton Vlcek: Digitale Modulationsverfahren mit Sinusträger, Springer 1996 Rudolf Greif: Bodenantennen für Flugsysteme, Oldenbourg 1974
Method(s) of instruction/ media being used	seminar, demonstration, practical course, self-study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2nd term
Compulsory requirements	none
Assessment	written test
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	150h of total work load, thereof 45h of contact hours and 105h of self-study, consisting of: 40 h seminar (preparation and rework) 35 h practical training (preparation and evaluation) 30 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.202**
Module name	**Design of Electronic Systems**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma), Me (Ma)
Module coordinator	Prof. Dr. Martin Hoffmann
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Advanced principles of construction for fail-safe electronic systems, detection and elimination of EMI-sources during the design process, application of learned methods and strategies for electronic system design
Module content	Characterization of interferences EMC-conform circuit design and layout Interaction of analog and digital units Optimization of shematics, criterias and strategies Power supply for analoge and digital units Connections and grounding design Simulation of complex electronic circuits Related regulatory standards Practical training
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lab instruction sheets, handouts
Recommended literature	Recommended literature will be announced in the lecture.
Method(s) of instruction/ media being used	lecture, practical course, self-study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Digital Systems, Analog Circuit Design, Electronic Components, Circuit Design, Digital Signal Processing
Assessment	exam 90 min exam 90 min, Laboratory internship certificate
Assessment modalities	PL - test performance (graded) APL - certificate (nongraded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 35 h lecture (preparation and rework) 35 h practical training (preparation and evaluation) 50 h exam preparation
Usability of this module	Complex Lab Session
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.203**
Module name	**Design of Electronic Components**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma), Me (Ma)
Module coordinator	Prof. Dr. Detlef Redlich
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Basic knowledge on the design of electronic components are to be taught. Students can apply the aquired knowlege designing electronic components. They are familiar with the certification according to ISO9000.
Module content	design methodology of electronic components wire connections certification according to ISO9000 design of the external equipment configuration, degree of protection, protection class CE-identification, 19“ boxes heat rejection section
Course type	1L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	script
Recommended literature	1. Scheel, W.: „Baugruppentechnologie der Elektronik, Montage“, Verlag Technik Berlin, bzw. Eugen G. Leuze Verlag, Saulgau, 1999 2. Remsburg, R.: Advanced Thermal Design of Electronic Equipment. Kluwer Academic Publishers 1998 3. Sergent, J. E. et al.: Thermal Management Handbook: For Electronic Assemblies (Electronic Packaging and Interconnection Series). McGraw-Hill Education 1998 4. VDI-Wärmeatlas. Berlin: Springer Verlag 1997
Method(s) of instruction/ media being used	Lecture, practical course
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	none
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 15 h lecture (preparation and rework) 20 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.208**
Module name	**Specialising module**
Department	Electrical Engineering and Information Technology
Degree program	ME (Ma)
Compulsory/ optional/ electiv	Elective Compulsory
Module content	The Specialising modules with 24 ECTS-credits allows a selection from modulesME.2.206 Experimentelle Modalanalyse ET.2.104 - Zuverlässigkeitstheorie ET.2.220 - Optische und optoelektronische Sensorik ET.2.221 - Integration von Mixed-Signal-Schaltungen ET.2.224 - Intelligente Systeme ET.2.231 - Signalintegrität ET.2.232 - Augmented Reality/ Virtual Reality ET.2.212 - Embedded Systems ET.2.202 - Design elektronischer Systeme
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term or winter term
Term	1st or 2nd term
ECTS credits	24
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.209**
Module name	**Specialising module**
Department	Electrical Engineering and Information Technology
Degree program	EE/IT (Ma)
Compulsory/ optional/ electiv	Elective Compulsory
Module content	The Specialising modules with 36 ECTS-credits allows a selection from modules out of the following allocated specialisation profile according to your interests: Specialisation profile – Automation Specialisation module II – Communication and Media technology Specialisation module III – Technical Informatics You can find the concrete module content in the relevant module description. ET.2.224 - Intelligente Systeme (AT, TI) ET.2.211 - Komplexe Steuerungen (AT) ET.2.120 - Optimale Steuerung und Regelung (AT) ET.2.217 - Technische Optik (AT, KMT) ET.2.215 - Informationstheorie, Kodierung und Datensicherheit (KMT, TI) ET.2.232 - Augmented Reality/ Virtual Reality (KMT, TI) ET.2.102 - Softwareengineering (KMT, TI) ET.2.101 - Theoretische Informatik (TI) ET.2.230 - Prozessordesign (TI) ET.2.231 - Signalintegrität (KMT) ET.2.212 - Embedded Systems (AT, KMT, TI) ET.2.107 - Servoantriebstechnik (AT) ET.2.220 - Optische und optoelektronische Sensorik (AT) ET.2.218 - Optoelektronik 2 (AT) ET.2.221 - Integration von Mixed-Signal-Schaltungen (KMT) ET.2.104 - Zuverlässigkeitstheorie (AT, KMT, TI) ET.2.105 - Anlogdesign (KMT)
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer/winter term
Term	1./2. Semester
ECTS credits	36
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.211**
Module name	**Advanced Control Systems**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Module coordinator	Prof. Dr.-Ing. Jörg Müller
Compulsory/ optional/ electiv	optional ET/IT (Ma) compulsory ME (Ma)
Learning objectives	After students have attended the course, they are able to - generalize parallel and concurrent processes, - calculate and predict their behavior, - transfer these processes to distributed systems, - plan with selected analysis and synthesis tools
Module content	- State description - Petri-nets - Process sequence schedule - object-oriented programming (OOP) for process control - distributed systems
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Lunze, J.: Ereignisdiskrete Systeme; München, Wien: Oldenbourg von Aspern, J.: SPS-Steuerungsentwicklung mit Petri-Netzen; Berlin: VDE Lewis, R.: Modelling control systems using IEC 61499; London: The Inst. of Electrical Engineers Vyatkin, V.: IEC Function Blocks for Embedded and Distributet Control Systems Design; Research Triangle Park, NC: ISA-Instrumentation, Systems, and Automation Society
Method(s) of instruction/ media being used	2
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Assessment	Laboratory internship certificate, seminar paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 25 h lecture (preparation and rework) 10 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.212**
Module name	**Embedded Systems**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma), Me (Ma)
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	At the end of the module students are able to create models of embedded systems with respect to the levels of abstraction of the Y-diagram of Gajski and Kuhn. The students understand the main concepts of modeling hardware based on the hardware description languages VHDL, Verilog, and SystemC including there specifics. The students remember the specifics of embedded systems as well as the general requirements, and they remember the design flow starting from a more abstract behavioural description down to the IC layout and they are able to apply the design flow based on Cadence Encounter design tools for simulation, verification, structural and layout synthesis. The students are able to evaluate the result of the design process and they are able to interfere into the automated design process.
Module content	- Embedded and real-time system specifics; - methodologies for the design of embedded systems; - concepts of hardware modeling and the design flow based on VHDL, Verilog, and SystemC including special concepts of behavioural modeling of concurrent systems; - high-level synthesis and modeling according to abstraction levels; - design tools for structural and layout synthesis; Cadence Encounter Design Flow; - adapted systems for embedded system and system-on-programmable-chip based applications; - verification, test benches, and design for test; - implementation of a microcontroller core in a CMOS technology.
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture notes, laboratory instructions, examples
Recommended literature	- P. Marwedel: Embedded System Design. Springer Verlag, 2011 - D. Gajski et al: Specifications and Design of Embedded Systems. AddisonWesley, 1994 - W.Wolf: Computers as Components - Principles of Embedded System Design. Morgan Kaufman Publ. 2012 - J. Teich: Digitale Hardware/Software Systeme. Springer 2007 - N.Weste et al: Principles of CMOS VLSI Design. AddisonWesley Publishing Company - N. Sherwani: Algorithms for VLSI Physical Design Automation. Kluwer Academic Publishers - T. Kropf: Introduction to Formal Hardware Verification. Springer Verlag - G. Herrmann, D.Müller: ASIC Entwurf und Test. Fachbuchverlag Leipzig, 2004 - D. Gajski et al: High-Level-Synthesis: Introduction to Chip and System Design. Kluwer Academic Publishers, 1992 - T. Kropf: VLSI-Entwurf. Vorgehen, Methoden, Automatisierung. Int. Thomson Publishing, 1995 - K. ten Hagen: Abstrakte Modellierung digitaler Schaltungen. Springer 1995 - A. A. Jerraya et al: Behavioral Synthesis and Component Reuse with VHDL. Kluwer Academic Publisher - D. C. Black et al: SystemC: From the Ground Up. Springer, 2010 - R. Brück: Entwurfswerkzeuge für VLSI-Layout. Carl Hanser Verlag
Method(s) of instruction/ media being used	Talk, group work, hands-on training, case study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Digital Systems, Digital Design, Information Technology

Assessment	Laboratory internship report
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 35 h lecture (preparation and rework) 85 h practical training (preparation and evaluation)
Usability of this module	Master thesis
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.214**
Module name	**Actuators**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma)
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	elective
Learning objectives	The students get to know the basic knowledge of the physical principles to generate mechanical forces. Building on that knowledge they understand the technical realisation of actuators, their behaviour and their mathematical description. The main topics are electro-magnetic and piezoelectric actuators. After attending the event, students are able to select and project appropriate actuators for a technical applications.
Module content	The topics of the lecture are - Introduction with explanation of the principles of energy conversion and the generation of mechanical forces - Electromagnetic actuators with solenoids, stepping motors, linear motors and magnetostrictive actuators - Electrostatic actuators (Piezoelectric actuators) - Electrothermic actuators (shape memory actuators) In the practical course the students work with the following experiments: - Solenoid - Stepping motor - Piezoelectric and shape memory actuators
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture papers and experiment instructions
Recommended literature	Janocha, H.: Aktoren Fatikow, S.: Mikroroboter und Mikromontage Jendritza, D.: Technischer Einsatz neuer Janocha, H.: Aktoren Fatikow, S.: Mikroroboter und Mikromontage Jendritza, D.: Technischer Einsatz neuer Aktoren
Method(s) of instruction/ media being used	lecture and experiment
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	Winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Electrical drives and system design
Assessment	exam 60 min
Assessment modalities	PL – during period of exams (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.215**
Module name	**Information Theory, Coding and Data Security**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	optional
Learning objectives	Upon completion of the module, students - understands the major sections of information transmission in space and time - are able to applicate selected coding methodes - understands the impact of some methodes on data security - are able to use math methodes to rate these - are able to evaluate coding methodes
Module content	- Basics of linear algebra, theory of finite elements - Basics of Information theory, source description, source coding - cryptography - channel models, channel entropies - channel coding, block coding - convolution coding - examples in simulation
Course type	2L - 2E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script, exercises and lab instruction sheets on the internet
Recommended literature	Rohling, Müller: Einführung in die Informations- und Codierungstheorie, Teubner 1995 Friedrichs: Kanalcodierung, Springer 1996 Schneider-Obermann: Kanalkodierung, Vieweg 1998 Bossert, M.: Kanalkodierung, Teubner 1998 Kreß ,Irmer: Angewandte Systemtheorie, Verlag Technik 1989 Lipp, M.: VPN – virtuelle private Netzwerke, Pearson 2001 oder Addison-Wesley 2001
Method(s) of instruction/ media being used	Lecture, exercises, lab session, self study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	none
Recommended requirements	Digital systems
Assessment	exam 90 min, Laboratory internship certificate
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	180h of total work load, thereof h of contact hours and h of self-study, consisting of: h lecture (preparation and rework) h practical training (preparation and evaluation) h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.217**
Module name	**Technical Optics**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional module
Learning objectives	After successful participation of the module, the students are able to - describe optical radiation in the wave particle duality, - describe optical proberties of matter (optical index and absorption), - describe simple optical phenomena and to use for the design of optoelectronic systems, - elaborate concepts of optical systems with the help of ray optics - characterise lenses and lens systems, and to apply the basics of laser optics.
Module content	Wave particle duality photons optical index and absorption reflection and scattering wave properties wave equation, interference, diffraction Fourier optics ray optics and optical imaging, aberrations lenses, apertures, mirrors, prisms, fibers, micro optics, achromats measurements of lens systems optical instrumentation Properties of laser radiation, optical resonators, Gaussian beams
Course type	2L - 1E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Learning Material	script, lab instruction sheets
Recommended literature	Born, M.: Optik Schröder, G.: Technische Optik Pedrotti: Optik Kühlke, D: Optik
Method(s) of instruction/ media being used	Lecture, exercises, self study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Recommended requirements	Mathematics, Physics
Assessment	oral exam
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h exercise (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.218**
Module name	**Optoelectronics 2**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	After successful participation of the module, the students are able to - Know of the effect conditions of special optoelectronic components in recessed way; - create concepts of simple optoelectronic transmission systems under consideration of disturbance variables and the dynamic behaviour; - construct and test of simple optoelectronic systems - use measurement techniques of fiber optics
Module content	- Mediation of the theoretical bases to photonics, dynamic events in semiconductor structures; - Fiber optics - Photonic transmission technology
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Paul: „Optoelektronische Halbleiterbauelemente“, Teubner-Verlag, 1992 Jansen: „Optoelektronik“, Vieweg, 1993 Jones: „Optoelektronik“, VCH, 1992 Ramaswami, „Optical Networks“, Morgan Kaufmann Publishers, 1998
Method(s) of instruction/ media being used	2L - 0E - 0S - 1P
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Assessment	oral exam
Assessment modalities	PL – exam during audit period(graded)
Further Information	In the exsam, students create solutions for selected optoelectronic questions, and calculate various technically relevant variables and parameters based on given practical examples.
ECTS credits	6
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.219**
Module name	**Laser Techniques**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma)
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	- knowledge of the effect conditions of laser - knowledge of the laser kinds and her operating conditions - ability of the laser use decision
Module content	- theoretical bases of laser - laser kinds and explanation forms - application of laser
Course type	2L – 0E – 0S – 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	- lecture script - lab instruction sheets
Recommended literature	- Bauer, H.: Lasertechnik - Eichler: Laser - Meschede: Optik, Licht und Laser - Treiber: Der Laser in der industriellen Technik
Method(s) of instruction/ media being used	Collection of transparencies, lecture, self- study, discussion at the laboratory
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2nd term
Compulsory requirements	none
Recommended requirements	Physics, Optics
Assessment	oral examination
Assessment modalities	PL – exam during audit period(graded)
ECTS credits	6
Workload	90 h of total work load, therefrom 45 h of presence at university 45 h of self-study
Usability of this module	- Optoelectronics - Optical and Optoelectronical Sensors
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.220**
Module name	**Optical and Optoelectronical Sensors**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Specialization/ Profil	AT
Module coordinator	Prof. Dr. Alexander Richter
Compulsory/ optional/ electiv	optional
Learning objectives	After successful participation of the module, the sudents are able to - use modern optical sensor technologies (micro-optics, fibre optics, integrated optics) - select components (optoelectronic light sources/detectors - define properties, topologies, classification - select working principles (intensity modulation, spectral encoding, interferometry, and other) - use signal processing concepts, multiplexing (sensor systems and networks) - define practial applications
Module content	- Modern optical sensor technologies (micro-optics, fibre optics, integrated optics) - Components (optoelectronic light sources/detectors - Properties, topologies, classification - Working principles (intensity modulation, spectral encoding, interferometry, and other) - Signal processing concepts, multiplexing (sensor systems and networks) - Applications
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Recommended literature	H.-R. Tränkler, E. Obermeier (Herausg.) "Sensortechnik" Handbuch für Praxis und Wissenschaft, Springer, 1998 W. Heiwang (Herausg.) "Sensorik", Reihe: Halbleiter-Elektronik Bd. 17, Springer 1993 P. Hauptmann "Sensoren: Prinzipien und Anwendungen" C. Hanser, 1990
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2nd term
Compulsory requirements	none
Assessment	oral exam
Assessment modalities	PL – exam during audit period(graded)
Further Information	In the exsam, students create solutions for selected optoelectronic questions, and calculate various technically relevant variables and parameters based on given practical examples.
ECTS credits	6
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 15 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.221**
Module name	**Integration of mixed-signal circuits**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma), ET/ IT (Ma)
Module coordinator	Prof. Dr.-Ing. habil. Jürgen Kampe
Compulsory/ optional/ electiv	Compulsory
Learning objectives	The student will be introduced to circuit design, to the automated design of complex integrated CMOS circuits and to related design tools. Sizing as well as layout synthesis will be emphasized. At the end of the module students are able to recognize the main basic and elementary circuit configurations for integrated CMOS circuits and to evaluate them on the base of there characteristics. The students are able to remember complex analog CMOS circuit configurations, used for signal conditioning and converting purposes in the interface region of integrated systems on chip. The students are able to find out the principle of operation of new circuit configurations and to size them with respect to a given application. The students are able to understand CMOS layouts and to synthesize, to verify and to rate layouts by the use of design tools.
Module content	- CMOS technology; - IC layout, layout design and verification; - basic and elementary circuit configurations of integrated CMOS design (i.e. current sources and mirrors, cascade, transfer switches, differential amplifier, output and bias stages); - complex integrated circuits (i.e. reference sources, OTA, optical receivers, comparators, VCO, AD and DA converters); - systematic design methodology for analog integrated circuits; - functional analysis of complex circuits, symbolic analysis, sizing, design space centering, trade-off curves and Pareto optimality; - design tools for integrated circuits (system level to layout, pre- and post-layout simulation and layout verification).
Course type	2L - 0E - 1S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature, lecture notes, lab instruction sheets
Recommended literature	Allen, P. E., Holberg, D. R.: CMOS analog circuit design. Baker, R. J.: CMOS: circuit design, layout, and simulation. Maloberti, F.: Analog design for CMOS VLSI systems Fischer, W.-J., Schüffny, R.: MOS-VLSI-Technik: Eine Einführung in Technologie, Entwurf, CAD-Systeme, Schaltkreise Gielen, G.: Symbolic Analysis for Automated Design of Analog Integrated Circuits. Gräb, H. E.: Analog design centering and sizing. Lienig, J.: Layoutsynthese elektronischer Schaltungen
Method(s) of instruction/ media being used	Talk, peer instruction, hands-on training, individual work, case study, self-study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term, summer term
Term	2nd term
Compulsory requirements	Analogdesign
Recommended requirements	Analog Circuit Design, Signals and Systems, Integrated Circuits
Assessment	Laboratory internship report
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 35 h lecture (preparation and rework) 35h seminar (preparation and rework) 50 h practical training (preparation and evaluation)
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena

Frequency of offer	Annually
Language	German

Module number	**ET.2.224**
Module name	**Intelligent Systems**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Module coordinator	Prof. Dr.-Ing. habil. Klaus-Peter Döge
Compulsory/ optional/ electiv	optional
Learning objectives	The students master the basics of strategies and algorithms of artifical intelligence. They are able to applicate these algorithms for concrete technical systems.
Module content	- Design of Fuzzy-Systems (control systems and data mining) - Artificial Neural Networks (Topologie, Training, Simulation and Design Tools) - Neuro Fuzzy Systems - Evolutionary Algorithms: Strategies, Optimization for Fuzzy and Neural Network Systems.
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture script
Recommended literature	Keller, H.B.: Maschinelle Intelligenz, F.Vieweg-Verlag, Braunschweig/Wiesbaden 2000 Ertel, W.: Grundkurs Künstliche Intelligenz, Vieweg und Teubner, Wiesbaden 2009 Alpaydin, E.: Maschinelles Lernen, Oldenbourg- Verlag, München 2008
Method(s) of instruction/ media being used	CAE-Tools (MATLAB/Simulink)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Automatic Control, Digital Control Systems
Assessment	exam 90 min
Assessment modalities	PL – university written exam during period of lectures (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 10 h practical training (preparation and evaluation) 15 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.230**
Module name	**Processor Design**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Specialization/ Profil	TI
Module coordinator	Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	optional
Learning objectives	After successfully completing the module students are able to: - understand the functional principle and possible applications of microcontrollers. - derive principles of assembler programming. - understand the interaction between hardware and software. - derive the consequences of design decisions. - systematically plan and design a digital processor.
Module content	Within the scope of this module the fundamental functional principle of a digital processor is covered in detail. Based on the knowledge acquired in the courses „Digital Circuit Design“ and „Microprocessor Technology“ a RISC processor with a given instruction set is designed by the students and implemented on a FPGA. Programs to run on this self-developed processor can be assembled with a provided Assembler tool. If the instruction set is extended by the students, they can adapt the Assembler accordingly. Based on the knowledge gained in this project processor architecture alternatives are introduced, e.g. VLIW and multi core processors.
Course type	1L - 0E - 0S - 3P (Lecture, Exercises, Seminar, practical course)
Learning Material	Lecture slides (in English) are provided via the Internet
Method(s) of instruction/ media being used	Lecture with practical course
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2nd term
Compulsory requirements	none
Recommended requirements	Programming skills and knowledge of digital circuit design, VHDL
Assessment	term paper, seminar paper, project work
Assessment modalities	APL – assessment during the semester period (graded)
Further Information	The deep understanding of basic processor principles and the ability to systematically design a processor and program the designed processor are demonstrated with the design and documentation of a functional processor followed by a project review.
ECTS credits	6
Workload	180h of total work load, thereof 60h of contact hours and 120h of self-study, consisting of: 110h design and test of Processor in VHDL 10h documentation of design
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.231**
Module name	**Signal Integrity**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Specialization/ Profil	KMT
Module coordinator	Prof. Dr. Ludwig Niebel
Compulsory/ optional/ electiv	Optional required module
Learning objectives	Upon completion of the module, students - understands the impact of lines on fast signals - are able to create models for simulation of these impact - are able to identify relevant parameters of lines - are able to verify simulation results by measuring - are able to use the knowledge while designing electronic modules
Module content	Model of matched lines Modelling of circuit parts and circuits in microwave frequency range Wave propagation on TEM lines Transmission line parameters in time domaine and frequency domain Dispersion Transmission line simulation in Spice Coupled lines, crosstalk Spice simulation of coupled lines, example: directional coupler Simulation usinf field solver (Microwave Studio from CST Darmstadt) Network analysis High-speed data communication via transmission lines Reflection and refraction of data words at impedance discontinuities Time domain reflectometry and transmission (TDR, TDT) Software-controlled TDR measurement system TDR-based Modelling of measurements results Design Methodology
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script and lab instruction sheets on the internet
Recommended literature	Unger, H.-G.: Elektromagnetische Wellen auf Leitungen. Heidelberg: Hüthig 1991 Dokumentation zu Microwave Studio von CST Darmstadt Schmidt, M.: Signalintegrität, Vogel 2013
Method(s) of instruction/ media being used	Lecture, practical training, self study
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2nd term
Compulsory requirements	none
Recommended requirements	Measurement Techniques
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 25 h lecture (preparation and rework) 10 h practical training (preparation and evaluation) 10 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.232**
Module name	**Augmented Reality / Virtual Reality**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT(Ma), RFE (Ma)
Module coordinator	Prof. Dr.-Ing. Sebastian Knorr
Compulsory/ optional/ electiv	Electiv
Learning objectives	At the end of the module students are able: - to distinguish between Virtual, Mixed und Augmented Reality - to digitalise information and present it user-friendly in VR, augment reality - to recognise application domains of this technology and implment it pototypicaly - to implement and apply interfaces - to assess limitations and requirements of AR / VR
Module content	Tracking-Systems, Head-Mounted Didplays, Mobile Computing, Digital Image Processing, Assistence Systems
Course type	2L – 0E – 0S – 2P (Lecture, Exercises, Seminar, practical course)
Learning Material	Literature recommendation specific to the seminar sessions
Recommended literature	- Dörner, R., Broll, W., Grimm, P., Jung, B. (Hrsg.): Virtual und Augmented Reality (VR / AR), Springer Verlag, 2013 - Marcus Tönnis: Augmented Reality: Einblicke in die Erweiterte Realität, Springer Verlag, 2010
Method(s) of instruction/ media being used	Seminar, Exercisises
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	Computer science basic knowledge, programming skills in at least one common programming language, basic knowledge in digital image processing
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
Workload	180h of total work load, thereof 45h of contact hours and 135h of self-study, consisting of: 100 h lecture (preparation and rework) 35 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.280**
Module name	**Project "Conception and execution of autonomous missions"**
Department	Electrical Engineering and Information Technology
Degree program	ET/IT (Ma), Me (Ma)
Module coordinator	Prof. Voß (ET/IT), Prof. Dienerowitz (SciTec)
Compulsory/ optional/ electiv	optional
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Assessment	project
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.300**
Module name	**Complex Lab Session**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), ET/IT (Ma)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Frank Giesecke, Prof. Dr.-Ing. Burkart Voß
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful conclusion of this module the students will be able to: - study technical literature and do review and evaluation for a given topic. - analyze a given problem with scientific methods, develop and evaluate proposals for solutions, document and implement selected solutions as well as present and interpret of the achieved result in a written form. - visualize and accurate present technical issues. - develop and formulate consistent and logically coherent thoughts.
Module content	Within the context of an ongoing research or development project at the university a subtask has to be solved. After a short introduction, an overview of the international standard of the topic has to be provided. An experimental setup has to be developed and used. Using scientific skills, chosen research problems have to be solved. Results have to be displayed and explained. Acquired knowledge and skills are a necessary prerequisite for the Master thesis.
Course type	0L - 0E - 0S - 4P (Lecture, Exercises, Seminar, practical course)
Learning Material	Technical literature, special application software, technical manufacturer information
Recommended literature	A general bibliographical reference cannot be given because it depends on the topic.
Method(s) of instruction/ media being used	Independent scientific work
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term, winter term
Term	2nd and 3th term
Compulsory requirements	none
Assessment	term paper
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	6
Workload	180 h
Usability of this module	Masterarbeit
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ET.2.301**
Module name	**Master thesis**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), Me (Ma), ETIT(Ma)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Burkart Voß, Prof. Dr.-Ing. Jörg Müller, Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	After successful conclusion of this module the students will be able to: - arrange and structure a scientific work. - study technical literature and do a review and an evaluation for a given topic. - analyze a given problem statement with scientific methods, develop and evaluate proposals for solutions, document and implement selected solutions as well as present and interpret of the achieved result in a written form. - visualize and accurately present technical issues. - develop and formulate consistent and logically coherent thoughts. - generate well-grounded scientific findings, which will be an engineering progress in this relevant field. - write orthographically and grammatically accurate text, which satisfies formal restrictions.
Module content	The topic of the master thesis has to deal with the design and evaluation of electronic systems, with information technology or with mechatronic systems. The thesis work can be done in the context of research and/or development tasks in universities as well as companies and research establishments in Germany or abroad. After an orientation phase the international state of the art in this specialized topic has to be discussed. With scientific methods the subject at hand has to get analyzed and proposals for solutions will need to be formulated. Experimental, design and/or theoretical work will have to be done to meet the goal. Furthermore a presentation and an interpretation of the results are required.
Course type	(Lecture, Exercises, Seminar, practical course)
Learning Material	Technical literature, patents, special application software, technical manufacturer information
Recommended literature	Grieb: Schreibtipps für Diplomanden und Doktoranden. Berlin: VDE-Verlag, 1993 Scholz: Diplomarbeiten normgerecht verfassen – Schreibtipps zur Gestaltung von Studien-, Diplom- und Doktorarbeiten. Würzburg: Vogel, 2001 Nicol: Wissenschaftliche Arbeiten schreiben mit Word – formvollendete und normgerechte Examens-, Diplom- und Doktorarbeiten (für Word 97, 2000, 2002). München: Addison-Wesley, 2002
Method(s) of instruction/ media being used	Independent scientific work
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summertermn
Term	3th term
Compulsory requirements	Successful completion of all compulsory modules and selected optional required modules, written registration of the topic of the master thesis
Assessment	Scientific work
Assessment modalities	final examination
Further Information	Hand over of master thesis just in time and tutor's report
ECTS credits	24
Workload	720 h
Usability of this module	Completion of second academic degree
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	each term
Language	German

Module number	**ET.2.302**
Module name	**Colloquium**
Department	Electrical Engineering and Information Technology
Degree program	RFE (Ma), Me (Ma), ET/IT (Ma)
Specialization/ Profil	EAT, TI, KMT
Module coordinator	Prof. Dr.-Ing. Burkart Voß, Prof. Dr.-Ing. Jörg Müller, Prof. Dr.-Ing. Frank Giesecke
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Presentation and defense of the results in the context of a colloquium.
Module content	The master thesis is presented in a colloquium. The candidate provides the goal, the most important results and conclusions in a presentation of 20 minutes (maximum). Subsequently the topics will be discussed. The total time the colloquium takes amounts to 60 minutes (or shorter).
Course type	Presentation, Colloquium (Lecture, Exercises, Seminar, practical course)
Learning Material	Technical literature, patents, special application software, technical manufacturer information
Recommended literature	Leopold-Wildburger; Schütze: Verfassen und Vortragen - wissenschaftliche Arbeiten und Vorträge leicht gemacht. Berlin: Springer, 2002 Franck: Rhetorik für Wissenschaftler - selbstbewusst auftreten, selbstsicher reden. München : Vahlen, 2001 Huth: Duden - Reden gut und richtig halten! -Ratgeber für wirkungsvolles und modernes Reden. Mannheim: Dudenverlag, 2000 Lucas: Überzeugend reden - mehr Erfolg durch richtige Rhetorik. Düsseldorf: Econ-Taschenbuch-Verlag, 1999
Method(s) of instruction/ media being used	Independent scientific work
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	3th term
Compulsory requirements	Successful completion of all compulsory modules and selected elective modules of the course, timely submission of the thesis and supervisor reports
Assessment	presentation, colloquium
Assessment modalities	final examination
ECTS credits	3
Workload	90 h workloadCompletion of the second academic degree
Usability of this module	full time
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	each term
Language	German/ English

Module number	**ME.2.102**
Module name	**Mechatronics**
Department	Mechanical Engineering
Degree program	Me (Ma)
Module coordinator	Prof. Dr.-Ing. habil Jörg Grabow
Compulsory/ optional/ electiv	Compulsory
Course type	2L - 2E - 0S - 0P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Heimann, Gerth, Popp: Mechatronik. Isermann: Identifikation dynamischer Systeme I, II. Isermann: Mechatronische Systemeat. Roddeck: Einführung in die Mechatronik.
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1. term
Compulsory requirements	none
Assessment	exam 90 min
Assessment modalities	PL – exam during audit period(graded)
Workload	180 h of total work load, thereof 60 h of contact hours and 120 h of self-study,
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ME.2.105**
Module name	**pattern recognition**
Department	Electrical Engineering and Information Technology
Degree program	ME (Ma)
Module coordinator	Prof. Dr.-Ing. Sebastian Knorr
Compulsory/ optional/ electiv	Compulsory
Learning objectives	- Hough transformation: detection of lines and circles - Detection of interest points - Transformations - Pattern recognition and machine learning, Bayes classifier, neural networks, support vector machines - Face detection and face recognition - object recognition
Course type	2L - 0E - 0S - 1P (Lecture, Exercises, Seminar, practical course)
Learning Material	books, script and lab instruction sheets on the internet
Recommended literature	- Burger, Wilhelm und Burge, Mark J.: Digitale Bildverarbeitung: Eine algorithmische Einführung mit Java, Springer Vieweg, 3. Auflage, 2015. - Burger, Wilhelm und Burge, Mark J.: Principles of Digital Image Processing, Vol. 3, Springer-Verlag, 2009, 2013. - Tilo Strutz: Bilddatenkompression, Vieweg + Teubner, 4. Auflage (2009). - Nischwitz, Alfred, Fischer, Max, Haberäcker, Peter, Socher, Gudrun: Computergrafik und Bildverarbeitung, Band 2: Bildverarbeitung, Vieweg und Teubner, 3. Auflage, 2011. - Weitere Literaturangaben in der Vorlesung
Method(s) of instruction/ media being used	nteractive lecture, practical course, self study
Level/ category	1 (Bachelor=1, Master=2)
Summer/ Winter	summer term
Term	1st term
Compulsory requirements	none
Assessment	Laboratory internship report, Programming project
Assessment modalities	APL – assessment during the semester period (graded)
ECTS credits	3
Workload	90h of total work load, thereof 45h of contact hours and 45h of self-study, consisting of: 20 h lecture (preparation and rework) 10 h exercise (preparation and rework) 15 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ME.2.108**
Module name	**Technical elective module**
Department	Electrical Engineering and Information Technology
Degree program	Me (Ma)
Module coordinator	Prof. Dr.-Ing. habil Jörg Grabow
Compulsory/ optional/ electiv	optional
Learning objectives	VM1 and VM2
Course type	(Lecture, Exercises, Seminar, practical course)
Level/ category	(Bachelor=1, Master=2)
Summer/ Winter	summer term , winter term
Term	1. and 2. term
Compulsory requirements	none
Assessment	see module describtion
Assessment modalities	see module describtion
ECTS credits	12
Workload	360 h
Time	According time table
Duration of module	2 terms
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ME.2.109**
Module name	**Mechatronics Project**
Department	Mechanical Engineering
Degree program	Me (Ma)
Module coordinator	Prof. Dr.-Ing. habil Jörg Grabow
Compulsory/ optional/ electiv	Compulsory
Course type	0L - 0E - 0S - 2P (2. term) 0L - 0E - 0S - 2P (3. term) (Lecture, Exercises, Seminar, practical course)
Learning Material	Folien der Vorlesung und Literaturhinweise
Recommended literature	Madauss, Bernd J.: Projektmanagement, 3. Auflage, Stuttgart 1990 Boy, J., u.a.: Projektmanagement; Bremen, 1994 Reschke, H.; Schelle, R.; Schnopp (Hrsg.): Handbuch Projektmanagement, 2 Bände, Köln, 1989 Wermter, M.: Strategisches Projektmanagement, Zürich und Köln, 1992 Wischnewski, E.: Modernes Projektmanagement, 4. Auflage, Braunschweig 1993
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term, summer term
Term	2. and 3. term
Compulsory requirements	none
Assessment	Project
Assessment modalities	APL - during term(graded)
ECTS credits	6
Workload	180 h
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ME.2.203**
Module name	**Actuators and Simulation of electromechanical Systems**
Department	Electrical Engineering and Information Technology
Degree program	Me (Ma)
Module coordinator	Prof. Dr.-Ing. Matthias Förster
Compulsory/ optional/ electiv	Compulsory
Learning objectives	Building on the physical principles used to convert controlled electrical energy into mechanical energy, an overview of the technically realized actuators and their laws is to be provided. The actuators should be selected for technical applications, simulated and projected in connection with control and coupled multi-mass systems. The focus is on electro-magnetic actuators and piezo actuators. After successfully participating in this course, students are able to analyze and mathematically describe the treated actuators with or without a coupled mechanical system, as well as to determine and simulate the system behavior.
Module content	The topics of the lecture actuators are: - Introduction with explanation of the principles of energy conversion and the generation of mechanical forces - Electromagnetic actuators with solenoids, stepping motors, linear motors and magnetostrictive actuators - calculation of magnetic fields - Electrostatic actuators (Piezoelectric actuators) - Electrothermic actuators (shape memory actuators) In the practical course the students work with the following experiments: - Solenoid - Stepping motor - Piezoelectric and shape memory actuators - magnetic field calculation and simulation In the lecture on the simulation of electromechanical systems, based on the knowledge of the module actuators mechatronics, the specifics of the simulation of such systems are presented. In the internship, selected systems are simulated and examined experimentally at the same time: -state size representation of a coil drive -Network simulation of a piezo actuator -Simulation and behaviour of a regulated positioning drive
Course type	3L - 0E - 0S - 3P (Lecture, Exercises, Seminar, practical course)
Learning Material	lecture papers and experiment instructions
Recommended literature	Grabow, J: Verallgemeinerte Netzwerke in der Mechatronik Stölting, H.; Kallenbach, E.; Amrhein, W.: Handbuch Elektrische Kleinantriebe Kallenbach, E.; Eick, R.; Ströhla, T.; Feindt, K.; Kallenbach, M.; Radler, O.: Elektromagnete Heimann,B.; Albert,A.; Ortmaier, T.; Rissing, L.: Mechatronik
Method(s) of instruction/ media being used	lecture and experiment
Level/ category	2 (Bachelor=1, Master=2)
Summer/ Winter	winter term
Term	2. term
Compulsory requirements	none
Recommended requirements	mechatronics
Assessment	Actuators: exam 90min Simulation of electromechanical Systems: term paper
Assessment modalities	Actuators: PL-exam during audit period(graded) Simulation of electromechanical Systems: APL – during term(graded)
ECTS credits	6
Workload	180h of total work load, thereof 90h of contact hours and 90h of self-study, consisting of: 30 h lecture (preparation and rework)

	40 h practical training (preparation and evaluation) 20 h exam preparation
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Module number	**ME.2.206**
Module name	**Experimental modal analysis**
Department	Mechanical Engineering
Degree program	Me (Ma)
Module coordinator	Prof. Dr.-Ing. habil Jörg Grabow
Course type	2L - 0E - 0S - 2P (Lecture, Exercises, Seminar, practical course)
Recommended literature	Waller, H.; Reinhard, S.: Schwingungslehre für Ingenieure Inman, D.: Engineering Vibration Natke, H.G.: Experimentelle Modalanalyse Verlag Technik Berlin
Level/ category	2 (Bachelor=1, Master=2)
Assessment	term paper
Assessment modalities	APL - during term(graded)
ECTS credits	6
Time	According time table
Duration of module	1 term
Place/ room	EAH Jena
Frequency of offer	Annually
Language	German

Map of UAS Jena campus

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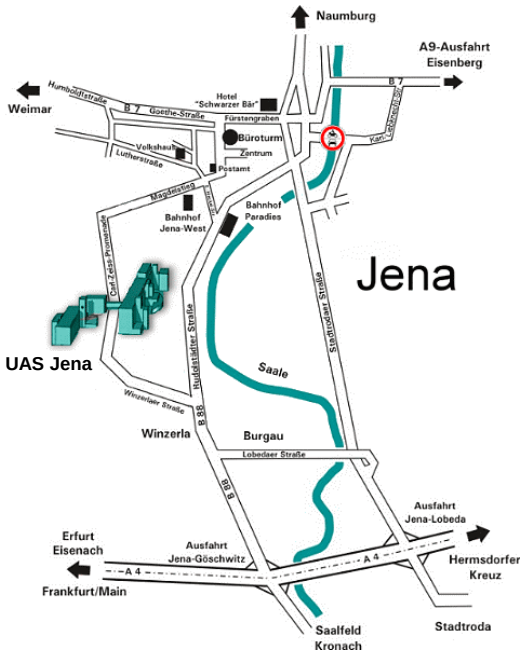

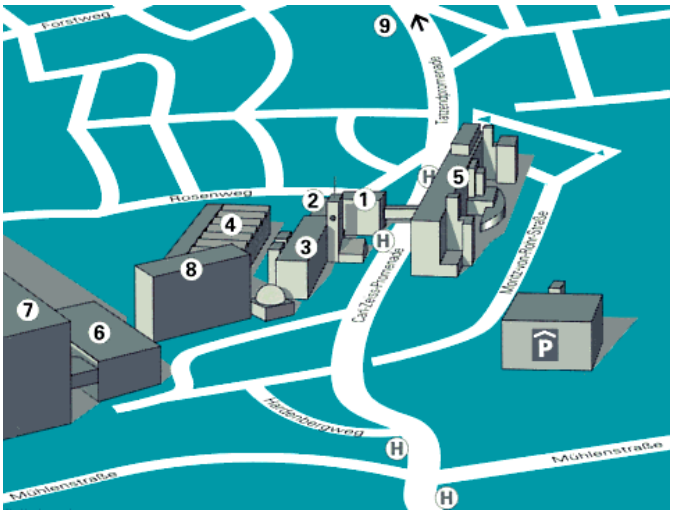

Published by: Rector of the University of Applied Sciences Jena
Editors: Hartmann/Guddei/Geller-Urban/Thomas
Going to press: 11/2010, editorial revised: 01/2019

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