Module Description ETB_412_422 Power Electronics

Last update: November 7, 2016

Degree: Bachelor of Engineering

1	**module no.** ETB 412 ETB 422	**degree programme** ETB AE AK	**semester** 4	**starts in** ☒WS ☒SS	**duration** 1 semester	**module type** mandatory	**workload (h)** 150	**ECTS Credits** 5

2	**lectures**	**type of instruction**	**language**	**contact hours (SWS)**	**(h)**	**self-study (h)**	**ECTS Credits**
	a) Assembly Technology of power control units	lecture including practice	English	4	**60**	**60**	**4**
	b) Assembly Technology Laboratory of power control units	laboratory	English	1	**5**	**25**	**1**
	c)						
	d)						
	e)						
	f)						

3	**table of qualifications**	expertise	methodological skills	personal & social skills
	knowledge & understanding	☒	☐	☐
	applying knowledge	☒	☒	☐
	analysing & evaluating	☒	☒	☐
	acquiring & broadening knowledge	☐	☐	☐

4 **learning outcome and competences**

On successful completion of the module the students are expected to be capable of:

- Principle evaluation of power electronics based power converters
- Have the cause effect relationship of loss free electrical energy conversion

knowledge and understanding

The students

- have a general understanding of loss-free energy conversion
- are expected to be capable of testing power electrical circuit diagrams on their function
- are capable of understanding power electrical components including basic areas of application in the field of power electronics
- know how far passive components can be applied
- know the principles of self-controlled and load-controlled power converter operations
- understand the functioning of self-controlled and load-controlled power converters
- know the importance of cooling concepts for power electrical based energy converters
- have a basic understanding of the different tasks in the assembly technology
- have a basic knowledge regarding default phenomena in the assembly technology

applying skills

The students

- are capable of establishing and calculating control characteristics of self-controlled and load-controlled power converters.
- are capable of understanding functional specifications of power converters.
- are capable of elaborating standard converter concepts according to the requirements.
- are able to characterize and validate power converters in the laboratory according to the conditions given.

analysing and evaluating

The students

- are capable of systematically implementing tasks of electronic power converters.
- are capable of classifying power converter designs with respect to their characteristics, advantages and

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	disadvantages. • are capable of technically supporting the process of choosing suitable power converters. • know about the thermal requirements in the assembly technology and understand them. **acquiring and broadening knowledge** • placing and arranging of power electronics components • Reconstruction of existing power electronics based work groups
5	**content** **a)** • assembling technology • understanding of passive components • understanding of active components • load-controlled converter configurations • concepts of self-controlled converters • control methods for electrical drives • energy converter concepts for electrical drives • photovoltaic inverters **b)** Testing of power converters in the following competences: • measuring loss-free self-controlled power converters • measuring load-controlled power converters • welding / bonding / analysing assembly technology **c)** • Load and grid controlled power converters • For example 2-puls bridge rectifier, full, half and uncontrolled **d)** Self commutated power converter • For example half bridges, forward converter, fly-back converter
6	**prerequisites** **According to the study and examination regulations:** advanced mathematics, electronics 1 and 2, electrical engineering 1 and 2 **recommended**: Understanding of electrical energy. Moreover, basic functions of passive and active components should be known. Mathematical skills are required.
7	**type of assessment and requirements for credits** a) Written exam b) Successful implementing of the project tasks in the team with report and construction (draft). The module is to be assessed. The module assessment is subject to the marks given for the different sub-modules according to the various credits. All sub-modules have to be passed.
8	**use of the module** mandatory module in the Bachelor Degree Programme of ETB AE AK
9	**person responsible for the module and other lecturers involved** Prof. Dr.-Ing. Martin Neuburger

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10	**literature** I. J. Lutz, Halbleiter -Leistungsbauelemente: Physik, Eigenschaften, Zuverlässigkeit, Springer Berlin Heidelberg New York, ISBN 10 3--540--342060--0 II. D. Schröder, Leistungselektronische Schaltungen: Funktion, Auslegung und Anwendung, Springer--Lehrbuch, 2. Auflage 2008, ISBN: 978--3--540--69300--0. III. G. Hagmann, Leistungselektronik -- Grundlagen und Anwendungen in der elektrischen Antriebstechnik, AULA--Verlag, 4. Auflage 2009. IV. J. Specovius, Grundkurs der Leistungselektronik -- Bauelemente, Schaltungen und Systeme, Vieweg + Teubner, 3. Auflage 2009. V. P. F. Brosch, J. Wehberg, J. Landrath, Leistungselektronik -- Kompakte Grundlagen und Anwendungen, Vieweg Verlag, 1. Auflage 2000, ISBN 3--528--03879--9. VI. R. Jäger, Leistungselektronik -- Grundlagen und Anwendungen, Berlin, Offenbach: VDE-Verlag, 6. Auflage. VII. M. Michel, Leistungselektronik -- Eine Einführung, Berlin, Heidelberg, New York: Springer--Verlag: 2011, DOI 10.1007/978--3--642--15984--8. VIII. R. Lappe, Handbuch Leistungselektronik, Berlin, München, Verlag Technik. IX. D. Anke, Leistungselektronik, München, Wien, Oldenburg, Verlag. X. W. Hirschmann, A. Hauenstein, Schaltnetzteile, Berlin, München: Siemens AG. XI. O. Klingenstein, Schaltnetzteile in der Praxis, Würzburg: Vogel--Verlag. XII. R. Jäger, E. Stein, Übungen zur Leistungselektronik, Berlin, Offenbach: VDE-Verlag. XIII. U. Schlienz, Schaltnetzteile und ihre Peripherie, ISBN 3--528--13935--8, vieweg--Verlag.
11	**contribution to the educational aims of the degree programme** Major in the key area of „Electrical units and renewable energies“ and „Electrical drive technology and automotive electronics” for the application in these areas. The students are capable of systematically programming, linking and operating mechatronical components and systems.
12	**last update** November 16