Module description ATB_411 Industrial Communications **Last update: December 20, 2016**

Degree: Bachelor of Engineering

1	**module no.** ATB 411	**degree programme** ATB SO	**semester** 4	**starts in** ☒WS ☒SS	**duration** 1 Semester	**module type** mandatory	**workload (h)** 150	**ECTS Credits** 5

2	**courses**	**type of instruction**	**language**	**contact hours (SWS)**	**(h)**	**self-study (h)**	**ECTS Credits**
	a) Industrial Communications		English	3	**45**	**45**	**3**
	b) Industrial Communications Laboratory		English	2	**24**	**36**	**2**
	c)						
	d)						
	e)						
	f)						

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

4 **learning outcome and competences**

On completion of the module the students are expected to be able to:

knowledge and understanding

The students

- know and understand the significance of communications technology in industrial environments.
- have a basic understanding of different network technologies.
- know and understand basic working methods of current multiple access protocols like ALOHA and CSMA.
- know and understand implications and restrictions coming along with the use of multiple access protocols with respect to the network dimensions depending on the data rate.
- have a basic overview of the available Ethernet standards.
- know and understand basic operation principles of link layer components like hubs and switches.
- have a basic understanding regarding the fundamental principles of IP networks.
- know and understand address allocation principles in IP networks.
- know and understand basic principles of IP Routing.
- know and understand basic standards of industrial communication protocols used in automation technology.
- have a basic understanding of the differences between classical communication networks and the communication methods used in automation technology.

applying skills

The students

- are capable of classifying different Ethernet technologies regarding their capability and are capable of selecting suitable Ethernet technologies for specific applications.
- are capable of selecting adequate Ethernet technologies for specific applications.
- are capable of assigning IP addresses in simple IP networks.
- are capable of setting up and configuring simple simulation models for Ethernet and IP networks using the network simulator OMNeT++.

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	• are capable of determining basic network parameters such as throughput and offered traffic using OMNeT++ for network simulatons. • are capable of configuring IP routers in order to link several IP networks on the internet layer. • are capable of judging and applying basic communication standards for automation technology regarding their suitability for certain applications. **analysing and evaluating skills** • are capable of analysing various network protocols by means of OMNeT++ • are capable of evaluating advantages and disadvantages of various network technologies by means of OMNeT++ • are capable of analysing the influence of various link layer network components on a network in a network simulation environment • are capable of observing and analysing the operation principles of network protocols **acquiring and broadening skills** • none
5	**content** **a)** • basics of communication networks • reference models • Ethernet • IP-networks • switching, routing • classical field buses and their applications • industrial Ethernet • wireless systems for industrial communication **b)** • introduction to the simulation tool OMNeT++ • simulation of Ethernet with OMNeT++ • simulation of IP-networks with OMNeT++ • set-up of an IP-network • configuration of IP-routers • basic aspects of Profinet
6	**prerequisites** According to the study and examination regulations : students of the advanced studies recommended: After having successfully passed the module Information Technology
7	**type of assessment and requirements for credits** a) written exam (90min) b) Successful passing of all laboratory units with profound and independent preparation. 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 ATB SO
9	**person responsible for the module and other lecturers involved** Prof. Dr.-Ing. Georg Schmidt

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10	**literature** • A. S. Tanenbaum, D. J. Wetherall, *Computernetzwerke*, Pearson, Aug. 2012
11	**contribution of the module to the educational aims of the degree programme** Acquiring skills qualifying future automation engineers. Students learn specific skills in the field of network basics, Ethernet, IP-networks, routing, network-simulation, field bus systems, industrial communication technologies.
12	**Last update** December 16