Technology
Arts Sciences
TH Köln

Course
FG - Introduction to Fieldbus Systems

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General information

Long name	Introduction to Fieldbus Systems
Approving CModule	FG_BaTIN, FG_BaET
Responsible	Prof. Dr. Rainer Bartz Professor Fakultät IME
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Rainer Bartz Professor Fakultät IME
Requirements	basic programming skills, incl.: for, while, if, switch data types in programming languages
Language	German
Separate final exam	Yes

Final exam

Details

written exam

Minimum standard

50%

Exam Type

written exam

Lecture / Exercises

Learning goals

Knowledge

topologies in communication networks: point-to-point, line, ring, star

notations in communication standards: service description, sequence diagram, state chart (Mealy-type)

ISO/OSI reference model: layer, encapsulation, functionality, service types (peer-to-peer, local), PDU-SDU-PCI-ICI, connection-oriented and connectionless communication

bit coding: digital (NRZ, PRZ, BiPhase-L, DPLM,...), analog (ASK, FSK, PSK, ...)

physical layer definitions of RS-232, RS-485

error detection: parity, block codes, checksum, CRC, ...

media access schemes: master/slave, token, CSMA/CD, CSMA/CA, ...

PhL and DLL of CAN (controller area network): content-based adressing, arbitration, error detection, standard vs. extended CAN, bit timing, fault management, acknowledge mechanism, services and protocols

Skills

students acquire fundamental knowledge on industrial communication systems

they understand how communication standards are specified and can apply them to given tasks

they understand fundamental concepts in the physical layer and can apply coding standards to create and analyze corresponding signal traces

they understand data link layer functionality and can explain media access and error correction algorithms

they know about all relevant aspects of CAN as a representative for industrial communications

students can apply widespread error detection algorithms

they can specify functionality and services of layers, using standard notation

they are able to analyze protocols and extract information from data streams

they are able to create protocol compliant data streams for transmitting specific information

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0
Tutorial (voluntary)	0

Separate exam

none

Practical training

Learning goals

Knowledge

microcontroller platform for fieldbus implementation (TI F28335 based)

development tools for embedded systems (CCS: Code Composer Studio)

programming in C language for systems without OS

performing CAN communication from a microcontroller program

F28335 microcontroller architecture and register model; programmed interaction

Skills

students can develop programs for an embedded system

they know how to use a development toolchain to test, analyze, and debug their code

they have experience in using CAN register-based communication interfaces to send and receive information

they can determine relevant communication parameters and configure a system accordingly

students can use embedded systems to implement industrial communication

they are able to implement software to send information over a communication channel

they are able to implement software to receive information over a communication channel

they can specify system behavior using state charts

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Separate exam

Exam Type

working on projects assignment with your team e.g. in a lab)

Details

team based project tasks

Minimum standard

assigned project tasks must be completed