Technology
Arts Sciences
TH Köln

Course Manual GTI

Microcomputer systems

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General information

Long name	Microcomputer systems
Approving CModule	GTI_BaET
Responsible	Prof. Dr. Markus Stockmann Professor Fakultät IME
Valid from	summer semester 2021
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Markus Stockmann Professor Fakultät IME Kellersohn
Requirements	Students have the knowledge (based on the lectures PI1 and IP) about the basics of programming (preferably in C), among them e.g. Structure of algorithmns, difference between programming language and machine language, declaration of variables, pointers, data types, functions, arrays and value representation in digital systems.

Literature

Skript, Literaturliste wird zu Beginn der Veranstaltung bekannt gegeben

Final exam

Details	Written examn in the focus of LO1 to test for the compentences K1, K2, K4, K5, K6 and K11. Due to the fact that the examn for the laboratory training is no individual examn, the other compentences will be tested as well but in less detailed manner.
Minimum standard	Students are proficient in standard techniques for implementing state machines with C programmes, application of Boolean algebra on practical topics. Abstracting practical tasks to model event-discret systems (state machines). Being able to integrate micro computers in systems by an abstract interface.

Language	German
Separate final exam	Yes

Exam Type	EN Klausur

− Lecture / Exercises

Learning goals

Goal type	Description

Special requirements

none

Accompanying material	script, bibliography (to be announced in first lecture)
Separate exam	No

Knowledge	elementary statemachine theory [knowing Boolean algebra (PFK.2, PFK.4, PFK.5), Boolean functional networks, basic math. operations of numbers (PFK.11), codes for information representation in computers (PFK.5, PFK.8, PFK.9, PFK.10), finite state machines (FSM) (PFK.5, PFK.7, PFK.8, PFK.9, PFK.10)] Basics of the technology of digital systems [ways of description (PFK.8, PFK.9), circuits, description language (VHDL), modues (PFK.9, PFK.10), digital standard-ICs, like AND, OR, NOT, XOR or decoder, multiplexer, configurable modules] Basics of programming in low-level with C (PFK.9) [pointers and pointer arithmetics, standard libaries (stdio, string)] low-level I/O-programming in C (PFK .9) [Structure of digital I/O-Ports, access to I/O-Ports via pointers, access to I/O-Ports via standard libaries, bit-based Input/Output and handling with C] Software-developement-surroundings (PFK.6, PFK.9) Developement of programs for measuring, regulating and controling in C (PFK.8, PFK.9, PFK.10) [FSM in C, structure of application oriented IO-libaries based on drivers] Structure and functionality of a microcomputer system (e.g. microcontroller) [architectural overview (register, arithmetic unit, control unit, storage, bus system, I/O-components) (PFK12), Functionality, meaning sequential programm processing by register transfers (PFK 11)] I/O-interfaces of a computer system and their usage with C (PFK.9) [digital ports (see above), Timer/Counter] Event driven programming in C (PFK8, PFK.9, PFK.11)

Skills	Deducing system behavior from specifiying words (PFK.1, PFK.2, PFK.4, PFK.7) [determine technical words, recognizing and understanding implicit information, recognizing missing information, deviating and requesting them] Usage of descriptive methods [Simple conversion of Boolean functions (PFK.2, PFK.11), transfering of a FSM in a C program structure (PFK.8)] strtucture of digital systems (PFK.6, PFK.8, PFK.9, PFK.10) [Tool usage for specification, model synthesis, systhematical test with test vectors] Structure of a control system by a computer (PFK.6, PFK.7, PFK.8, PFK.9, PFK.10) [Understanding and explaining the function of a micro computer system including simple I/O-interfaces, usage of driver libaris in C for different IO infterfaces with interrupt functionality, digital ports, timer/counter, system programming with C, deducing system behavior from specifying words, creating state transition diagrams]

Expenditure classroom teaching

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

− Practical training

Learning goals

Goal type	Description
Knowledge	Structure of digital systems (PFK.6, PFK.8, PFK.9, PFK.10) [Tool usage for specification, model synthesis, systhematical test with test vectors, realisation, configuration by tool, testing on real system] Structure of a control system by a computer (PFK.6, PFK.7, PFK.8, PFK.9, PFK.10) [Interpreting and using simple technical specifications of I/O interfaces, usage of driver libaris in C for different IO infterfaces with interrupt functionality,digital ports, timer/counter, system programming with C, deducing system behavior from specifying words, creating state transition diagrams, implementing in C by the usage of driver libaries]
Skills	working on complex tasks in small teams (PSK.1, PSK.6) developing a digital control system [understanding and analysing clearly arranged problem statements (PFK.2, PFK.7), deducing system behavior from specifying words, structural system analysis, finding meaningful subsystems, creating interfaces between subsystems, problem solving by usage of development tools, testing it and launching it in the real system (PFK.8. PFK.9, PFK.10)] Developing a control system with microcontrollers and C programs [understanding and analysing clearly arranged problem statements (PFK.2, PFK.7), deducing system behavior from specifying words, structural system analysis, finding meaningful subsystems, creating interfaces between subsystems, problem solving by usage of development environment in in C,testing it and launching it in the real system (PFK.8, PFK,9, PFK.10)]

Special requirements

no additional

Accompanying material	Prefabricated material (experiment description, assisting sheets, referenced collateral), simulation tools.
Separate exam	No

Expenditure classroom teaching

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