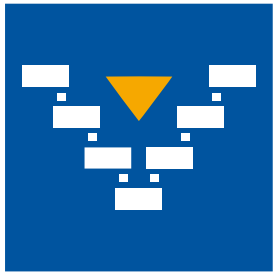
Informatik 11
Embedded Software

RWTH AACHEN UNIVERSITY



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Introduction to Embedded Systems

Prof. Dr.-Ing. Stefan Kowalewski | Julius Kahle, M. Sc.

Summer Semester 2025

Part 7

Information

Information: First Exam (31.07.25)

- Two cohorts due to limited capacity
- First cohort
  - Exam: 9:00 am to 10:30 am
  - Entry: 8:45 am
  - Sparkassenforum, ZuseLab C1/C2/C3/C4/C5, Couven Halle
- Second cohort
  - Exam: 11:00 am to 12:30 pm
  - Entry: right after first cohort (more information coming)
  - Sparkassenforum
- Check in RWTHonline on which cohort you are assigned to?

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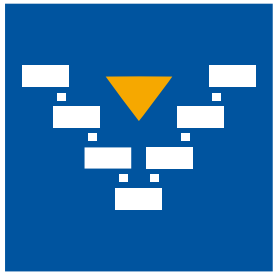

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Evaluation Results

Evaluation results - Global

- 11 participants
  - 985 registered students to this course
  - 650 / 132 registered students to the exam (1st attempt / 2nd attempt)

Global indicator

mw=1,3
s=0,5

Konzept der Vorlesung / Lecture Concept

mw=1,3
s=0,5

Konzept der Übung / Exercise Course Concept

mw=1,4
s=0,6

Vermittlung und Verhalten - Vorlesung / Instruction and Behavior - Lecture

mw=1,2
s=0,4

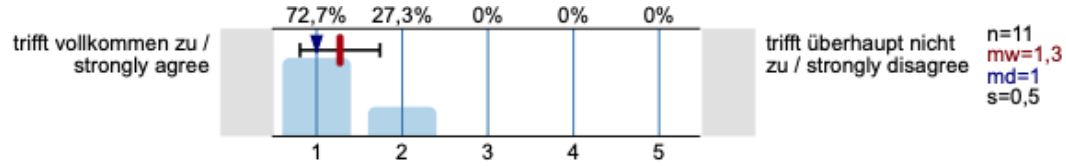
Vermittlung und Verhalten - Übung / Instruction and Behavior - Exercise Course

mw=1,4
s=0,6

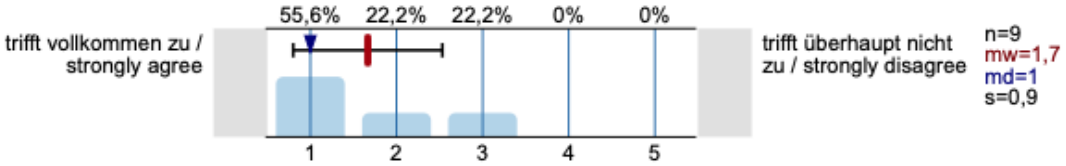
Evaluation results (ctd.)

- Lecture

Es werden Zusammenfassungen an sinnvollen Stellen gemacht. /
Lecture material is summarized at appropriate intervals.

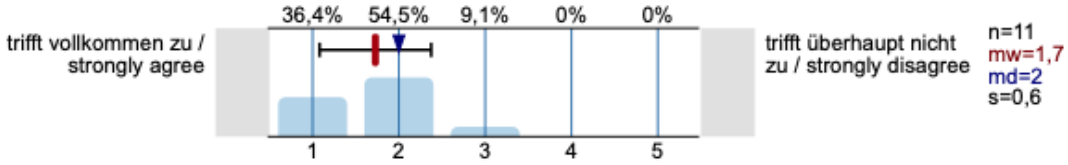


... schafft es, mich für den Vorlesungsstoff zu begeistern. /
... engages my interest in the topic.



- Exercise

Die Übungsaufgaben sind verständlich gestellt. /
The exercise tasks posed in the exercise course are understandable.



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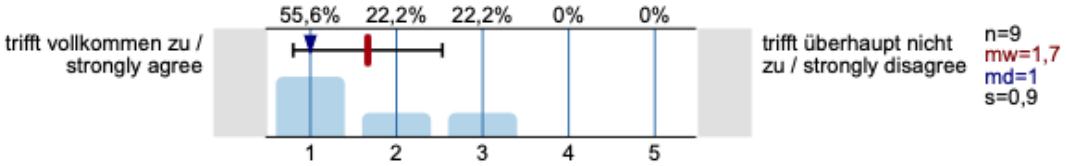
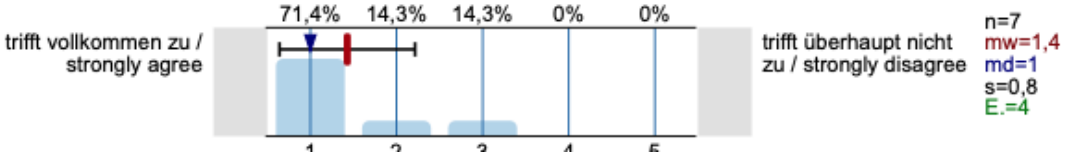


- Digital Learning Opportunities

Der Lernerfolg konnte aufgrund des digitalen Lernangebots gesteigert werden. / The learning success increased because of the digital learning opportunities.



Evaluation results (ctd.)

- Videos in Moodle
- Livestream
- Good responsiveness
- Comprehensive explanation
- Appropiate examples
- Helpful exercise tasks
- Exercises after every chapter

- No previous exams supplied
- No recommendations
  - Further courses in this field
  - Further information on this topic
- Slow pace for easy content
- No corrected exercises
- Optional E-Tests for preparation (?)
- Slides not understandable without voice track

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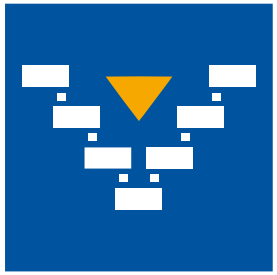

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Recapitulation

Wrap-up

- Introduction
  - Embedded and Embedding System
  - Non-functional requirements
  - Product and production automation
- Microcontrollers
  - Architecture
  - Digital I/O
  - Timers, counters, PWM
  - DA/AD conversion
  - Interrupts & Polling
- Data buses
  - Topologies
  - Physical layer – Bit encoding
  - Data link layer (logical link & medium access)
  - Error corection
  - I^2C, CAN, FlexRay, Profibus
- Programmable logic controllers
  - Discrete vs. continuous control
  - PLC architecture & program execution
  - Reaction time
  - Languages
  - Standard function blocks
- Real time
  - Hard & Soft Real time
  - OSEK, task model
  - Deadlock
  - Priority inversion & how to avoid it
  - Scheduling
  - Task parameters, Utilization
  - RMS, EDF
- Embedded software design
  - Development Process Models
  - Functional Requirements
  - Analysis: Context diagrams, use cases, sequence diagrams
  - Nonfunctional/quality requirements
  - Analysis: Utility tree, scenarios
  - Architecture design
- Software Development with Simulink
  - Rapid control prototyping