Fachbereich Maschinenbau und Verfahrenstechnik
Faculty of Mechanical and Process Engineering

Organization

Lecturers	Prof. Dr. Wolfgang Grote-Ramm M.Sc. Jörn Hornig
Lecture (2 SWS) and Hands-on exercises (2 SWS)	Tuesdays | 9:00 – 12:30 | weekly | lab 05.2.018
Workload	180h | 60h (attendance time) | 120h (self-study)
Credits	6 CP
Conditions of participation	Nothing special. Basic Programming skills warmly recommended (e.g., C, Java, Matlab).
Type of examination	Homework (50 %) and oral exam (50 %)
Language	English

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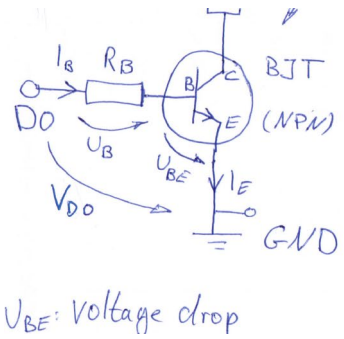
General Information

The elective strongly focusses on practical exercises using a microcontroller (µC) evaluation board (Arduino) for solving typical automation tasks by connecting the µC to the real world (sensors, actuators, electronic devices, LCD panels …) and the internet (IoT).
Students will program their µC in the lab and at home using the Arduino IDE (and Matlab/Simulink for some occasions) with their own laptops. Some existing programming skills (C, Java or Matlab) are warmly recommended for this course.
Evaluation board and other required equipment will be lent and handed over to the students in the first session.
Alternatively, students can buy their own equipment (approx. 75 €).
The number of participants is limited due to limited equipment.



$I_B \cdot h_{FE} = I_C$ $\quad h_{FE} \gg 1$: Transistor gain → data sheet

Selecting R_B:

$V_{DO} = U_B + U_{BE} = R_B \cdot i_B + U_{BE}$

$V_{DO} = R_B \cdot \frac{i_C}{h_{FE}} + U_{BE}$

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Contents

- Range of application for µC, µC architecture, programming of µC, basics of C programming and cross compilation.
- Real-time systems, I/O ports, system clock, timers and interrupts, timing in automation and control tasks with time-discrete systems
- Basic electronics in the peripheral µC-context, acquisition of analog data (ADC), output of analog data (DAC, PWM), communication via interfaces (serial bus, I^2C, SPI), µC as embedded system, networking with µCs, connection and circuitry of actuators and sensors
- (Industrial) Internet of Things
- Rapid prototyping of automation algorithms on µC using Matlab/Simulink.
- Most subjects are elaborated practically with hands-on exercises in the context of automation and open and closed loop control.