



Munich Summer School of Applied Sciences 2023

Course description

- Course title: Embedded Systems
- Hours per week: 20 hours per week, 2 weeks total
- Number of credits recommended/workload:
 - a) 40 contact hours
 - b) 3 US Quarter.credits
 - c) 4 ECTS credits
- Description
 - Embedded systems are prevalent in today's world - you can find an embedded system in cell phones, automobiles, microwave ovens, and home automation devices. In this class, the fundamentals of embedded systems hardware and firmware design will be explored. The Microchip ATMega328 will be used to create small embedded designs.
- Course outline:
 - Microcontroller structure and functionality
 - Sensor overview
 - Basics of C programming
 - Digital Inputs/Outputs
 - Analog Digital Conversion (ADC)
 - Interrupt management
 - Timer functions
 - Output compare function
 - Pulse Width Modulation (PWM) generation
 - Input capture usage
 - Peripheral Buses
 - Serial interface (USART)
 - Serial Peripheral Interface (SPI)
- Objective of the course/learning outcomes: After finishing the course, the student shall be able to:
 - Explain how a microprocessor, memory, peripheral components and buses interact in an embedded system

- Sketch a design of an embedded system around a microcontroller
 - Describe the key architectural components of a microcontroller
 - Design and implement C programs for embedded systems to sense and actuate external devices
 - Interface hardware components to microcontroller-based systems
 - Evaluate how architectural and implementation decisions influence performance and power dissipation
 - Work efficiently with partners and participate in the design and development process
- Prerequisites:
 - Computer programming (C language preferred)
 - Computer Architecture (recommended, but not required)
 - Recommended reading: Course material will be provided by the instructors.
 - Teaching methods:
 - The morning and afternoon sessions will contain interleaved lecture and lab sessions
 - Assessment methods: laboratory assignments, 1 final exam (written).
 - Language of instruction: English
 - Name of lecturers:
 - Prof. Dr. Christian Kissling (HM Hochschule München University of Applied Sciences, Germany)
 - Prof. Dr. John Seng (California Polytechnic State University, San Luis Obispo)