Modulbezeichnung	**Real-time Operating Systems Development**
Modulverantwortliche(r)	Jan Peleska
Modulart	Pflicht/Wahl ☐ Wahlpflicht ☒
Spezialisierungsbereich	Automatisierung und Robotik, Systemsoftware / Eingebettete Systeme, Raumfahrt-Systemtechnik
Dauer des Moduls	1 Semester
Kreditpunkte	6 CP
Arbeitsaufwand	Berechnung des Workloads Präsenz 0 h Übungsbetrieb/Prüfungsvorbereitung 180 h Summe 180 h
Turnus des Moduls	every year
Voraussetzung für die Teilnahme	Keine ☐ Folgende: Formale Voraussetzungen: KeineInhaltliche Voraussetzungen: Good programming skills in C are mandatory. A thorough understanding of basic operating systems concepts is very helpful for this lecture.
Lehr- und Lernformen	Seminar ☐ Vorlesung ☒ Tutorium ☒ Praktikum ☐ Projekt ☐
Lernziele	Students 1) know how to program a real-time application from scratch on “bare-metal”, that is, WITHOUT a supporting operating systems 2) know how to design an elegant real-time operating system kernel from scratch 3) understand the right balance between architectural beauty and optimised performance 4) know about basic benchmarks assessing the real-time capabilities of an RTOS 5) know how to do practical real-time application programming and RTOS development from scratch on a simple ARM-based computer architecture (BeagleBone Black)
Lerninhalte	. 1) Bare-metal programming on BeagleBode Black boards using the Code Composer Studio development environment (Eclipse-based) 2) The State Machine programming paradigm with cooperative multi-tasking, scheduling, watchdog monitor 3) Periodic time-controlled activities 4) Simple context switching: Programming user threads and associated schedulers 5) Inspiration from micro kernels: RTOS architecture with communication channels and ports 6) Filtered and prioritised real-time port handling 7) Real-time synchronisation mechanisms 8) Time-triggered versus event-based RTOS paradigms 9) RTOS Benchmarks
Prüfungsformen	Oral module examination or Exercises and oral technical discussion (Fachgespräch)

Literatur	● Wang, K.C. Embedded and Real-Time Operating Systems. DOI 10.1007/978-3-319-51517-5_2. Springer 2017. ● Kopetz, H. Real-Time Systems: Design Principles for Distributed Embedded Applications. Second edition. Springer 2011. ● Walls, C. Building a Real-Time Operating system. Rtos from the ground up. Elsevier Science & Technology 2007. ● Cooling, J. Real-time Operating Systems Book 1. The Theory. Lindentree Associates, 2017. ● Cooling, J. Real-time Operating Systems Book 2. The Practice. Lindentree Associates, 2017.