

Modulbeschreibung für die zentralen Module/ Description de module pour les modules centraux

Version: 1.0

Datum / Date: 18.10.07

Allgemeine Informationen / Information générale

<i>Modulbezeichnung / Désignation du module</i>
Mobile Devices
<i>Modulkategorie / Catégorie du module</i>
<input checked="" type="checkbox"/> Technisch-wissenschaftliche Vertiefung / Approfondissement technique et scientifique <input type="checkbox"/> Erweiterte theoretische Grundlagen / Bases théoriques élargies <input type="checkbox"/> Kontextwissen / Savoirs contextuels
<i>Lektionen / Périodes</i>
<input checked="" type="checkbox"/> 2 Vorlesungslektionen und 1 Übungslektion pro Woche / 2 périodes de cours et 1 période d'exercice par semaine <input type="checkbox"/> 2 Vorlesungslektionen pro Woche / 2 périodes de cours par semaine
<i>Unterrichtssprache / Langue d'enseignement</i>
Lausanne: French Bern: French/German Zürich: German
<i>Kurzbeschreibung /Absicht und Inhalt des Moduls in einigen Sätzen erklären / Brève description /Explication des intentions et du contenu du module en quelques phrases</i>
<p>This module sensitizes the students to the problems linked to embedded computer science and to consumer's equipment market with restricted memory resources and computing power, such as mobile phones, smart cards etc. The module explains the structural organization and architecture of mobile devices, focusing on sensor interfaces and wireless technologies. The student acquires an outline on operating systems and application technologies in this domain (J2ME and .NetCF). They become acquainted with development and simulation environments and will know how to develop applications for mobile devices.</p>

Ziele, Inhalt und Methoden / Objectifs, contenu et méthodes

<i>Lernziele, zu erwerbende Kompetenzen / Objectifs d'apprentissage et compétences visées</i>
<p>Hardware and Technology</p> <ul style="list-style-type: none"> • Students can describe the main hardware components of mobile devices and the constraints for the design of mobile devices • Students can derive the most adapted connectivity solution for a mobile device <p>Operating systems</p> <ul style="list-style-type: none"> • Students can describe architecture and functionality of common operating systems for mobile devices (Symbian, Windows Mobile, ...). • Students can explain the specific mechanisms of operating systems for mobile devices. <p>Applications</p> <ul style="list-style-type: none"> • Students can describe architecture and functionality of common frameworks for mobile devices (Java ME, .Net CF, ...)

- Students can design client and server applications on common mobile devices taking into account their limited resources.

Modulinhalt / Contenu du module

Hardware and Technology (5 semaines)

- Hardware architecture of mobiles devices
- Short range communication: Bluetooth, Zigbee, RFID
- Porting operating systems to a target hardware

Operating systems (4 semaines)

- Architecture and mechanism of operating systems for mobile devices (Overview, Architecture, Scheduling, Memory, Security, ...)
- Case Studies: Symbian OS, Windows Mobile, Embedded Linux

Applications (5 semaines)

- Network Programming, Embedded Servers
- Software development & frameworks (Java ME, Net CF)
- Mobile Platforms, Human Interfaces

Modulplan mit Gewichtung der Lehrinhalte / Plan du module avec pondération des contenus d'enseignement

Week	Topic
1	Introduction to mobile devices, system constraints, low power characteristics
2	Architecture of mobile devices, hardware platforms, baseband (processor core, ..) communication, radio interface
3	Case study: design of mobile device, part I From end user requirements to the design of the hardware/software application. Presentation in 3 weeks of an industrial design applied to a low power computing system and dedicated transmission-module (ISM-Band or Bluetooth), integrated with one measuring sensor.
4	Case study: design of mobile devices, part II
5	Case study: design of mobile devices, part III
6	Introduction to Operating Systems for Mobile Devices Case study: <ul style="list-style-type: none"> • Symbian I (Overview, Architecture, Scheduling, Memory, Security, ...) Exercise <ul style="list-style-type: none"> • Implementing an application for Symbian OS (C++, Mobile Device Emulator)
7	Case study: <ul style="list-style-type: none"> • Symbian II (Programming Model, Applications for Symbian OS, Tools for Developing)

8	Case study: <ul style="list-style-type: none"> • Windows Mobile (Overview, Architecture, Scheduling, Memory, Security, ...) Exercise: <ul style="list-style-type: none"> • Implementing an application for Windows CE (C++, Mobile Device Emulator)
9	Case study: Embedded Linux
10	Java ME Architecture Overview & and Development Environments and Toolkits Exercises for different configurations (CDC, CLDC) and profiles(CDC Profiles, MIDP).
11	Human Interfaces Java ME (Graphics, Files Systems and Object Store) Exercise: Implementing an application in Java ME
12	Embedded Servers Java ME (Graphics, Communication, networking, HTTP security) Exercise: Implementing an application in Java ME
13	Network programming (sockets, BlueTooth). Optional Packages (JSR 179)
14	.Net CF Architecture Overview & and Developement Environments and Toolkits theoretical exercices.

Modulorganisation (z.B. Aufteilung in Kurse) / Organisation du module (p. ex. division en cours)

Course	Title	Weeks
1	Hardware and technology	1-5
2	Operating Systems	6-9
3	Applications	10-14

Lehr- und Lernmethoden / Méthodes d'enseignement et d'apprentissage

Lecture course with exercices related to Bloom Taxonomy (understand, apply, analyse and produce).

Voraussetzungen, Vorkenntnisse, Eingangskompetenzen / Connaissances et compétences prérequis

The students have working knowledge in

- CPLD, FPGA

- computer systems, processors, bus systems, concepts of operating systems
- programming in Java & C++
- software development and frameworks
- concepts of user interfaces, MVC

Bibliografie / Bibliographie

Hardware and Technology

- Karim Yagmour: Building Embedded Linux Systems, First Edition April 2003 (Second Edition announced for Spring 2008), O'Reilly
- David Kammer, Gordon McNutt, Brian Senese, Jennifer Bray: Bluetooth Application's Developer Guide, Elsevier

Operating System

Symbian

- Richard Harrison, Mark Shackman ... [et al.]: Symbian OS C++ for Mobile Phones. Volume 3 - Application Development for Symbian OS v9
- Richard Harrison, Alan Robinson ... [et al.]: Symbian OS C++ for Mobile Phones. Vol. 2 - Programming with Extended Functionality and Advanced Features

Windows CE

- Douglas Boling: Programming Microsoft Windows CE.Net, Third Edition
- Chris Muench: The Windows CE Technology Tutorial: Solutions for the Developer

Embedded Linux

- Pichai Raghavah, [et al.]: Embedded Linux system design and development
- Karim Yagmour: Building embedded Linux systems

Applications

- [FREE J2ME BOOKS](#)
- [Java ME Technology APIs & Docs](#)
- [Sun J2ME Wireless Toolkit](#)
- [Java 2 Micro Edition \(J2ME\) Versus Microsoft Embedded Architecture](#)
- [NetBeans Mobility Pack for NetBeans IDE \(far better than Sun WTK32\)](#)

Leistungsbewertung / Mode d'évaluation

Zulassungsbedingungen für die Modulschlussprüfung (Testatbedingungen) / Conditions d'admission aux examens de fin de module (tests exigés)

- (no Testatbedingung / tests exigés)

Schriftliche Modulschlussprüfung / Examen de fin de module écrit

Prüfungsdauer / Durée de l'examen

90 min

Erlaubte Hilfsmittel / Moyens autorisés

Open book

Bemerkungen / Remarques

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