City University of Hong Kong

Information on a Course
offered by Department of Electronic Engineering
with effect from Semester B 2013/14

Part I

Course Title: Development and Design in Embedded Systems

Course Code: EE5414

Course Duration: One Semester (13 weeks)

No. of credits: 3

Level: P5

Medium of Instruction: English

Prerequisites: Nil

Precursors: EE3206 Java Programming and Applications or
                                       EE2331 Data Structures and Algorithms, or equivalent.
Equivalent Course: Nil

Exclusive Courses: Nil

Part II

Course Aims:

In this course, knowledge and hand on experience of on-board embedded systems are introduced. Linux kernel, device drivers, and hardware interfacing of the embedded device will be studied. Android is then used as a development platform for the embedded system in this course. Design and implementation in the Linux hardware drivers, and application software for Android will be discussed. Mini-projects and experiments with hand-on experience for implementing real-time applications will be carried out. Discovery Learning Experience (DLE), and assessment methods will be used in this course.

Course Intended Learning Outcomes (CILOs)
Upon successful completion of this course, students should be able to:

No.	CILOs
1.	Describe the embedded Linux Kernel and Device Drivers.
2.	Evaluate Android architecture and Android Runtime-Instances of Dalvik, services, Dalvik virtual machine and Zygote.
3.	Apply Android and port it to an embedded device, and to configure the Linux kernel and drivers to support Android.
4.	Innovative design, analysis and Implementation to hardware interfacing of embedded systems for Linux or Android platforms will be discussed.

Teaching and learning Activities (TLAs)

(Indicative of likely activities and tasks designed to facilitate students' achievement of the CILOs. Final details will be provided to students in their first week of attendance in this course)

CILO	Teaching and Learning Activities
1, 2, 3, 4	Lectures, tutorials, case studies and laboratory sessions.

Timetabling Information

Pattern	Hours
Lecture:	39*
Tutorials:	
Laboratory:	
Other activities:	

*Some of the lecturers will be conducted in the laboratory.

Assessment Tasks/Activities

(Indicative of likely activities and tasks designed to assess how well the students achieve the CILOs. Final details will be provided to students in their first week of attendance in this course)

	Type of assessment tasks	*Weighting (if applicable)*
Continuous Assessment	Assignments, tests, Labs , lab reports, case studies, and presentations	60%
Examination	Written exam	40%　2 hours

To pass the course, students are required to achieve at least 35% in course work and 35% in the examination. Also, 75% laboratory attendance rate must be obtained.

Grading of Student Achievement: - Please consider amending it according to the recommended sample attached.

Letter Grade	Grade Point	Grade Definitions
A+ A A-	4.3 4.0 3.7	Excellent
B+ B B-	3.3 3.0 2.7	Good
C+ C C-	2.3 2.0 1.7	Adequate
D	1.0	Marginal
F	0.0	Failure

Constructive Alignment with Programme Outcomes

PILO	How the course will contribute to the specific PILO(s)
1,2,3,4,5	This course provides essential knowledge and techniques for innovative designing and implementing hardware interfacing with embedded systems. Students have ample opportunities to practice what they have learnt in the course with real hardware and good software development environment in the mini-project studies.

Part III

Keyword Syllabus:
Introduction of Embedded Linux
System Requirements, Linux Installation, Linux Boot Process, Embedded Linux file system.

Embedded Linux Kernel, Construction of Device Driver

Interfacing in Embedded Linux
Asynchronous Serial Communication Interfacing (example Minicom),Parallel Port Interfacing, USB Interfacing, Memory I/O Interfacing, Synchronous Serial Communication Interfacing and Using Interrupts For Timing.

GCC, Shell, and Python Programming
GCC compilation and debugging, Shell Script and PythonProgramming.

Android Operating System

Android Kernel-Binder, Power, Ashmen, Low Memory Killer, ADB.Android Runtime-Instances of dalvik, services, Dalvik virtual.

Procedures of Porting Android Operating System to Custom Hardwares

References
- Embedded Linux Hardware,Software, and Interfacing, by Craig Hollabaugh. Addsison Wesley, Year!
- Practical Linux programming : device drivers, embedded systems, and the Internet, by Ashfaq A. Khan. ，Hingham, Mass.:Charles River Media, Inc.
- Professional Android 2 Application Development, by Reto Meier, Wiley India Pvt Ltd
- The Android Developer's Cookbook Building Applications with the Android SDK, by James Steele Nelson To, Addsison Wesley
- Bad to the Bone: Crafting Electronics Systems with Beaglebone and BeagleBone Black by Steven Barrett and Jason Kridner, Morgan & Claypool Publishers.
- Learn Raspberry Pi with Linux by Peter Membrey and David Hows, [New York]: Apress,c2013.

Mini-projects and laboratory experiments to the course include:

Beagle Board XM (TI) Android porting and LCD driver implementation.

Beagle Bone Black Mini-project & Raspberry Pi Mini-project