

ELEC4330

Mobile Embedded Systems: Hardware Platform, Software Development, and Applications

Course Description

This course introduces the hardware platform, the OS and software development platforms, and applications of Android-based smartphones and tablets. It will cover: hardware platforms of smartphones/tablets and their key components, such as mobile processors, communications chips, display, touchscreen, graphics, camera, battery, GPS, and various sensors; tutorials of Android and applications development on Android; latest applications, such as augmented reality, location based service, mobile TV, mobile health, mobile social network, handheld games, mobile computer vision, etc; low power hardware and software design techniques. *Prerequisite(s)*: ELEC 2300 OR ELEC 2350 OR ISDN 4000F *Corequisite(s)*: ELEC 3300

List of Topics

Lecture Outline

1. Course overview
2. Introduction to smartphone/tablet platforms (HW, SW and applications)
3. System-on-a-chip (SoC) architecture
4. Smartphone/tablet hardware components Part 1 (applications processor, mobile baseband processor, integrated radio chips for Wifi, BT, FM, GPS, and NFC)
5. Smartphone/tablet hardware components Part 2 (memory/storage and camera)
6. Smartphone/tablet hardware components Part 3 (sensors, display, touchscreen, and GPS)
7. Low power design techniques and energy sources
8. Mobile operating systems and software development cycles
9. Mobile applications (mobile computer vision, mobile augmented reality, e-health, etc.) and their technical requirements

Laboratory Outline

1. First trial of android SDK
2. Leveler - Learning 2D Drawings and Accelerometer
3. Tic Tak Toe – Learning to use touch screen and LogCat
4. Remote Camera – Learn to use camera module on the phone
5. 3D Die – Learn to use OpenGL in android phone
6. Locator – Learn to set up background service and GPS
7. Object Locator with Bluetooth Low Energy/2.4Ghz Proprietary Development Kit

Statement of Objectives/Outcomes:

On successful completion of this course, students will be able to:

CO1 - obtain a holistic view of embedded system design using smart phone as an example.

CO2 - recognize and understand the basic software and hardware components of an embedded system.

CO3 - understand the anatomy of a smart phone and identify the key hardware of a smart phone and software components of a mobile operating system.

CO4 - analyze, design, and debug simple software and hardware components used in an embedded system.

CO5 - experience embedded system design through hand-on experience

CO6 - obtain knowledge and experience in developing real applications on mobile embedded system platform.

CO7 - work in a team environment: learn and practice effective project and time management

Textbook(s):

Nil

Reference Books/Materials:

K. Prasad, *Embedded Real-Time System: Concepts, Design & Programming*, Dreamtech Press, 2009

R. Santos, and A. E. Block, *Embedded Systems and Wireless Technology: Theory and Practical Applications*, CRC Press, 2012

J. Gardner, V. K. Varadan and O. O. Asadelkarim, *Microsensors, MEMS and Smart Devices*, Wiley, 1st edition. 2001

Z. Mednieks, L. Dornin, G. B. Meike and M. Nakamura, *Programming Android: Java Programming for the New Generation of Mobile Devices*, O'Reilly Media, 2nd Edition, 2012

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Lab & Homework	30%
Mid-term Examination	25%
Quiz	5%
Term Project & Presentation	40%