LEBANESE AMERICAN UNIVERSITY
School of Arts and Sciences
Division of Computer Science and Mathematics
Fall 2007/2008
CSC788 : Topics: Pervasive and Mobile Computing
(Wednesday 16:30 – 19:00, BB 1003)

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Office Hours: MF 10:00 – 13:00

Purpose
To cover state-of-the-art technologies and infrastructures involved in building up pervasive and mobile computing solutions, including mobile terminals, mobile wireless access, research and development challenges surrounding mobile systems programming, and network infrastructure.

Objectives
The objectives of this course are to give students:
- Understanding of mobile device technologies and platforms including Symbian, Windows CE, and J2ME
- Understanding of the challenges involved in programming devices with limited resources such as memory, battery lifetime, and processing power and ways to combat these challenges
- Understanding of underlying wireless network technologies and applied standards in building up pervasive and mobile computing solutions including WiFi, WiMax, cellular systems, Bluetooth, infrared, short-range radio technologies (Bluetooth), mobile IP, wireless TCP, etc.
- Skills in programming mobile applications using J2ME and Symbian C++ environments
- Research experience in state-of-the-art technologies that relate to pervasive computing including power-aware computing, wearable computing, and smart environments.

Learning Outcomes
At the end of this course, students will:
- Be aware of latest developments in the fields of pervasive and mobile computing
- Be aware of the challenges raised when programming mobile devices as compared to personal computers and workstations
- Learn the workflow and techniques for mobile application development
- Have hands-on experience and acquire skills in developing applications for mobile devices with different platforms
- Learn the memory-related considerations for implementing applications that run on a device that is constantly turned on
- Use preallocation and static reservation to simplify memory management
- Use linear data structures rather than non-linear counterparts to enable more efficient cache usage

- Use dynamic linking and plugins to enable adaptations and extensions to an already existing system
- Use of dynamic linking as a technique to enable memory savings and to specialize a framework in a controlled fashion
- Learn the implementation considerations for concurrent programming
- Use threads in mobile Java to enable concurrency
- Use active objects in Symbian C++ to enable simplified pseudo-parallel executions that use less resources than the common concurrency facilities such as threads and processes
- Be familiar with existing mobile platforms and their differences including Windows CE, Palm OS, Symbian OS, etc.
- Write mobile applications using J2ME and Symbian C++
- Write mobile applications involving databases and networking aspects
- Design and implement easy to use user interfaces for small screen devices
- Perform testing and debugging on emulators and on real devices
- Understand the different wireless network technologies including WiFi, WiMax, Bluetooth, cellular
- Understand various mobile protocols including Mobile IP and Wireless TCP
- Be familiar with various mobile architectures such as WAP
- Be familiar with the current research trends that relate to pervasive computing and their challenges such as wearable computing and smart environmnets
- Acquire research experience in the field of pervasive and mobile computing
- Enhance technical documentation and presentation skills

Lecture Material and Schedule
I. Pervasive and Mobile Computing (1 session)
    a. Introduction
    b. Application Areas and Services
    c. Challenges
II. Devices (3 sessions)
    a. Technologies
    b. Platforms
        i. Windows CE
        ii. Symbian OS
        iii. Qtopia
        iv. J2ME
    c. Software Environments and Tools
III. Programming Mobile Devices (5 sessions)
    a. Applications
    b. Managing Resources
    c. Memory Management
    d. Dynamic Linking
    e. Concurrency
    f. Networking
IV. Mobile Networking and Wireless Technologies (3 sessions)
    a. Wireless Technologies: WiFi, WiMax, Bluetooth, Infrared, Cellular
    b. Mobile Protocols and Architectures
        i. WAP Architecture and Application Environment
        ii. Mobile IP and Wireless TCP
    c. Mobile Network Programming

V. Research Trends (1-2 sessions)

a. Power-Aware Computing
b. Wearable Computing
c. Smart Environments

Teaching Method   Lectures; projects

References

1. Hansmann, Merk, Nicklous, and Stober. Pervasive Computing. 2nd ed. Springer, 2003.

2. Zheng and Ni. *Smart Phones and Next Generation Mobile Networking*. Morgan Kaufmann, 2005.

3. Mikkonen. *Programming Mobile Devices: an Introduction for Practitioners*. Wiley, 2007.

4. Fitzek and Reichert. *Mobile Phone Programming and its Application to Wireless Networking*. Springer, 2007.

Grading Policy		
	Four Projects	40%
	Research Project	25%
	Final Exam	35%

Grading System

Grade	Quality Points	Grade	Quality Points
A	4	D+	1.33
A-	3.67	D	1
B+	3.33	F	0
B	3.0	P	No quality Points
B-	2.67	NP	No quality Points
C+	2.33	U	No quality Points
C	2	W	No quality Points
C-	1.67	I	No quality Points

Policy on Cheating and Plagiarism
Students caught cheating on an exam receive a grade of zero on the exam in their first cheating attempt in the course and receive a warning. Students caught cheating for the second time in the same course will receive a grade of "F" in the course and a second warning.

Plagiarism on assignments and project work is a serious offense. If plagiarism is detected, a student will be subject to penalty, which ranges from receiving a zero on the assignment concerned to an "F" in the course.

University Attendance Policy
Missing one third of classes implies that you will have to drop the course.

Remarks
- Deadlines for the project assignments **must be respected**. Late submissions will not be accepted.
- Make-ups and Incomplete: students are not automatically entitled to make-ups; F will be given until written reasons are presented and approved. Students should present their written reason **within one week after the exam date** otherwise it will not be accepted.