

**CRN# 23501 CPET 56500-01D Mobile Computing Systems
CRN# 23502 CPET 56500-01I Mobile Computing Systems (Distance)
Cross-listed
A Specialty Course
for
Purdue University - M.S. in Technology Graduate Program
IT/Advanced Computer Apps Track**

Spring 2017

Course Description

CPET 56500 - Mobile Computing Systems, 3 cr

An introduction of the system architecture, technologies, and applications of mobile computing. Topics covered include: mobile and wireless environment; mobile device technology; mobile computing architecture and protocols; mobile computing security; and applications in wireless and mobile computing, including distribution applications, mobile middle-ware, mobile information and database access, mobile multimedia, and remote execution. A combination of lectures, reading, presentation and reports, case studies, and group discussions is used.

Preparation for Course

P: B.S. degree in CS, EET, CPT, or EE, or senior/graduate standing and consent of instructor. Must be familiar with basic concepts in operating systems and networks; a good knowledge of either C/C++ or Java programming language.

Dual Level Course; Dual Level, Undergraduate-Graduate

Course Instructor Information

Paul I-Hai Lin, Professor of Electrical and Computer Engineering Technology
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Office: ET 205C Email: lin@ipfw.edu or pilin@purdue.edu

Office Hours:

- Monday 1:00 - 3:00 PM, 6:00-7:00 PM
- Tuesday 11:00 -12:00 Noon, 5:00-6:00 PM
- Wednesday 2:00 - 3:00 PM
- Thursday 11:00 - 12:00 Noon

Class Lecture and Course Material

Lecture: Room ET 346, Tuesday & Thursday 12:00 – 1:15 PM

Expected Out of Class Study Hours: minimum 8 hrs/week

Course Website, <http://www.etc.ipfw.edu/~lin>

Important Dates: <http://www.ipfw.edu/academics/calendar/>

- Monday, Jan. 16, Martin Luther King Jr. B.D. – No Class

- March 6 – March 12, Spring Break – Spring Break
- Final Project Report & Presentation – May 2, 1 p.m to 3:00 p.m.,
<http://www.ipfw.edu/academics/finals/>

Disabilities Statement:

If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact the Director of Services for Students with Disabilities (Walb, room 113, telephone number 481-6658), as soon as possible to work out the details. Once the Director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information, please visit the web site for SSD at <http://new.ipfw.edu/disabilities/>

IPFW Academic Regulation:

9. Academic Honesty: It should be noted that the policy of the University that any student found to have engaged in any activity constituting academic dishonesty will receive an "F" for the course in which the activity occurred or a dismissal from the University. The following web page explains the policy in detail:

<http://bulletin.ipfw.edu/content.php?catoid=38&navoid=1019#Disciplinary>

Code of Student Rights, Responsibilities, and Conduct"

- **Part II. Student Conduct Subject to Disciplinary Action,**
<http://bulletin.ipfw.edu/content.php?catoid=38&navoid=1019#Disciplinary>
 - **A. Academic misconduct**

Course Objectives

The main goal of the course is to provide an introduction to the fundamental problems in mobile computing, mobile computing supporting technologies, and mobile computing applications and services to graduate students in MS Technology program at IPFW.

Course Outcomes (CPET 565)

After successfully completing CPET 565, students will be able to

- Explain the principles of mobile computing technologies
- List different applications that mobile computing technologies offer to general public, businesses
- Familiar with mobile app development environment and tools
- Conduct trade-off analysis of mobile computing technologies for particular IT and/or business application
- Develop and present a mobile computing application project

Course Outcomes (CPET 499/ITC 499)

After successfully completing CPET 499, students will be able to

- Explain the principles of mobile computing technologies
- List different applications that mobile computing technologies offer to general public, businesses
- Familiar with mobile app development environment and tools
- Design and develop mobile apps for mobile devices such as smartphone, tablet and iPad, etc

Class Activities and Assessment

The class format will be 3 hour lecture each week, 16 weeks total and require about 8hrs/week for out of class study, research, an/or mobile app programming. Student assignments include programming apps, weekly assignment on reading technical papers, writing short summary, and presentation. Students are also required to complete a final project working in groups of 2-3 students, present projects in class and complete a written project report.

Grading policy:

- Assignments (readings, case study research and presentation) & Lab Exercises - 40%
- Exams (two exams) – 20%
- Class participation (attendance, class discussion, etc) – 5%
- Final project (proposal, report, presentation/demo) – 35%

Grading Scale: A (90-100%), B (80 -89%), C (70-79%), D (60-69%), F (0-59%)

Tentative Course Outline/Topics of Discussion

1. Introduction to Mobile Ubiquitous Computing Systems
 - The Mobile Waves:
 - cell phones, PDA (personal digital assistance), handheld computers, mobile notebook (laptop)
 - Smartphones (integration of various technologies)
 - Tablets: e-books, e-magazines, e-news papers
 - Mobile apps: business & intelligence, commerce, education, learning, office app, entertainment, personal healthcare, social networking, industrial applications, etc
 - Dimensions of Mobility: Location awareness, Network Connectivity Quality of Service (QoS), Limited device capabilities (storage, CPU, etc), Limited power supply, User interface support, Platform proliferation, Active transactions
 - Ubiquitous computing, Wearable computing, Mobile computing, Nomadic computing
 - Internet of things
 - Differences between distributed computing and mobile computing
 - Applications of mobile computing
 - Types of mobile networks (cellular, Ad hoc, etc)
 - Mobile Sensors
2. Mobile Computing Devices and Technologies
 - Mobile Devices/Hardware: Smartphone, iPad, Tablet, embedded computers, Internet of things
 - Human-machine interface, Biometrics, other Sensors (GPS, Motion sensor/Accelerometer, Ambient light sensor, etc.)
 - Mobile Operating Systems
 - Application Apps and Developing Software

3. Mobile Communications & Wireless Networking Infrastructure, Communication Protocols and Services
 - Mobile Computing Architecture, Client-Server Systems, Mobile Peer-to-Peer Computing
 - Mobile System Networks
 - Cellular Network:
 - Wireless Medium Access & Control: CDMA (Code Division Multiple Access), 3G, 4G LTE, GSM (Global System for Mobile Communications), Mobile Satellite Communication Networks
 - WiFi, Mobile IP Network Layers, Mobile Transport Layer
 - Ad-Hoc Networks
 - Middleware, Wireless Services
 - Mobile and Wireless Protocols: Mobile IP, Jini, Mobile ATM, Wireless Access Protocol, Routing, Security
 - Wireless Technologies: Bluetooth, 802.11x, 802.15x, ZigBee, WiMax
 - Mobile Services: Telephony, Short Message Service (SMS), Multimedia Messaging Service, GPRS (General Packet Radio Service),
4. Mobile Client Development & Programming
 - Mobile Application Development Frameworks and Tools: Android, iPhone OS, Microsoft Mobile OS
 - Android Activity and Lifecycle, User Interface, Data Access (SQLite and File Storage)
 - UML (Unified Modeling Language) for Mobile App Development
 - Developing Apps for Android-based Smartphones
 - Cloud-based Mobile Apps
5. Mobility Management
 - Location Tracking Technology; Location Management Principles & Techniques: Registration area-based loc. Management; Location Management Case Studies
 - Mobile Data Collection, Synchronization and Management
 - Mobile security and privacy issue
6. Data Dissemination & Management and Service Management
 - Accessing Info on Remote Data Servers (Web servers or File Servers)
 - Mode of Operations: On-demand mode (pull mode), Publish-subscribe mode (push mode)
 - Mobile Data Caching
 - Mobile Cache Maintenance
 - Mobile Web Caching
7. Context-Aware Computing
 - Ubiquitous or Pervasive Computing
 - Contextual Information: who, where, interaction
 - Context-Aware & Adaption Applications
 - Middleware Support
8. Mobile Middleware and Applications
 - Mobile Middleware
 - Adaptation: Resource monitoring, strategies
 - Mobile Agents and Architectures

- Service Discovery
 - Services: Push-based services, Pull-based services, Multimedia services, Data synchronization
 - Mobile Information Access (MWWW), Mobile Database Access (MODBC), Mobile File Access (MLDAP)
9. Mobile Computing Security Issues
- Wireless Data Security (Wi-Fi)
 - Security Management
 - Remote Access Best Practices
10. Emerging Services for Mobile Computing
- Broadband Mobile Internet Service
 - The Telematic Service – in vehicle multimedia services that offers information as well as information on traffic ad emergency reuse operations via location-based mobile communication networks
 - The RFID-Based Service – Use RFID and sensor technology to collect information on the product and gathers information on its surrounding environment
 - The Home Network Service – future services including information appliance control, interactive D-TV, video on demand, health care, and e-learning to be provided at home
11. Case Studies of Mobile Computing Systems and Applications
- Smartphones, iPad and Tablet Apps
 - Mobile and Wireless Technology for Telemedicine: standards, information management, and technical applications
 - Patient Monitoring using Mobile Computing and Ad Hoc Wireless Networks
 - Mobile Computing for Military Applications
 - Mobile Computing for Medical and Healthcare Applications
 - Mobile Computing for Business Applications: Customer Relationship Management, Sales Automation, etc
 - Augmented Reality

Class Material:

Primary Text:

Android Programming Concepts, by Trish Cornez and Richard Cornez, publisher Jones & Bartlett Learning, ISBN 978-1-284-07070-5, www.jblearning.com

Reference Books:

1. Fundamentals of Mobile and Pervasive Computing, by Frank Adelstein, Sandeep K.S. Gupta, Golden G. Richard III, and Loren Schwiebert, publisher McGrawHill, ISBN 0-07-141237-9.
2. ***Mobile Computing: Technology, Applications, and Service Creation***, by Asoke K. Talukder and Roopa R. Yavagal; publisher – McGraw-Hill, ISBN 9780071477338
3. ***Beginning Mobile Application Development in the Cloud***, 2012, by Richard Rodger, ; publisher Wrox – John Wiley & Sons, Inc, ISBN 9781118034699
4. ***Mobile Computing***, 2nd Edition, by Raj Kamal; publisher Oxford Higher Education, ISBN 9780198068914

5. ***Mobile Computing Principles – Designing & Developing Mobile Applications with UML and XML***, 2005, by Reza B’Far, published by Cambridge University Press, ISBN 0-521-81-733-1
6. ***The Handbook of Mobile Middleware***, 2007, edited by Paolo Bellavista and Antonio Corradi, published by Auerbach Publications.

Magazines/Transactions/Journals References (access through myIPFW – Hemlke Library – E Journal Fineder & Academic Search Premier) – quick topic & abstracts available from IEEE CS Digital Library, <http://www.computer.org/portal/web/csd/home>

- IEEE Computer
- IEEE Internet Computing
- IEEE Multimedia
- IEEE Pervasive Computing
- IEEE Security & Privacy
- IEEE Software
- IT Professional
- IEEE Transactions on Mobile Computing
- IEEE Transactions on Services Computing

Books - iPhone, iPad, Android, Window Phone Programming References

- *Professional iPhone and iPad Application Development*, 2011, by Gene Backlin, from Wrox- Wiley Publishing, Inc.
- *Programming the Mobile Web*, 2010, by Maximiliano Firtman, from O’Reilly.
- *Programming in Objective-C 2.0*, 2nd Edition, 2009, by Stephen G. Kochan, from Addison-Wesley.
- *iPhone SDK Application Development*, 2009, by Jonathan Zdziarski, from O’Reilly.
- *Learning iPhone Programming*, 2010, by Alasdair Allan, from O’Reilly.
- *iPhone SDK 3 Programming*, 2009, by Maher Ali, from Wiley.
- *Professional Android 4 Application Development*, 2012, by Reto Meir, from John Wiley & Sons, Inc.
- *Android Wireless Application Development*, 2nd edition, 2011, by Lauren Darcey and Shane Conder, from Addison-Wesley.
- *Windows Phone 7 Secrets*, 2011, by Paul Thurrott, from Wiley
- *Programming Windows Phone 7*, 2010, by Charles Petzold, from Microsoft Press

Reading List - In addition to the required text and course notes, substantial reading will be required from professional periodicals, journals, articles, or via the Internet. Course instructor will prepare the reading list in the order of topics of discussion.