Course Title	**Mobile and Ubiquitous Computing**				
Course Code	**ACSC423**				
Course Type	**Elective**				
Level	**BSc (Level 1)**				
Year / Semester	**4th , 7th or 8th**				
Teacher's Name	**Andreas Constantinides, PhD**				
ECTS	6	Lectures / week	2	Laboratories/week	2
Course Purpose	Mobile and Ubiquitous Computing touches on a wide range of topics including distributed computing, location computing, mobile networking, context-aware computing, sensor networks and many more, expands beyond the traditional challenges of those areas and more importantly demonstrates its value and importance through a device that lies on its backbone. That is, the cell phone, or more precisely the smarpthone where its advanced capabilites in terms of processing power and memory, extended number of connection modalities and with an unlimited number of sensors, made it the most widely adopted and ubiquitous computer ever existed. The purpose of this course is to provide students with the knowledge of the essential tools and techniques in order to extend critical awareness of the issues and challenges associated with mobile and ubiquitous computing, and enhance their understanding on mobile systems. Moreover, it enables students to practice in various development platforms and toolkits to successfully design and develop mobile applications.				
Learning Outcomes	By the end of the course, students should be able to: • Understand the major concepts and components of wireless and mobile networks • Describe and discuss the next generation mobile systems (e.g., smartphones, tablets) and their application areas. • Introduce the principles of distributed computing, mobile computing and their applications • Describe and discuss the emerging topics (vision, motivation, challenges) of pervasive and ubiquitous computing as well as context-aware computing and their applications • Explain and show the ability to implement concepts related to the design and utilization of smart (mobile) systems. • Demonstrate basic knowledge in developing smartphone applications using various platforms, toolkits, APIs and third-party libraries.				
Prerequisites	ACS183, ACOE323		Corequisites		None

Course Content	This course consists of the following chapters: • **Introduction on Wireless and Mobile Networks:** Satellite Networks, Wireless PAN, LAN, WANs, Cellular Networks, Signal Propagation, Multiplexing, Wireless Sensor Networks, Ad-Hoc Networks, Mobile Ad-hoc Networks, Vehicular Ad-hoc Networks, RFID, NFC. • **Distributed Computing:** Centralized, client/server architecture, distributed systems, strengths and weaknesses, message passing, distributed objects, remote procedure calls (RPC), Middlewares, Java Remote Method Invocation (Java RMI), CORBA. • **Mobile Computing:** Motivation, Challenges, Models, Databases and Mobile Computing, Mobile Agents, Data Management, Disconnections, Weak Connectivity, Mobility, Failure Recovery. • **Pervasive and Ubiquitous Computing:** Vision, Motivation, Challenges, Sensing in Ubiquitous computing, UbiComp Systems, Applications • **Next-generation Mobile Systems:** Smartphones and Tablets. • **Context-aware computing:** Context-Awareness, Context, Challenges, Handling multiple contexts, Applications, Location-awareness, Localization • **Smartphones:** History and evolution, Operating Systems, Technologies, Tools and Platforms, Marketplaces and stores, Market-share and Monetization • **Laboratory:** Introduction on Smartphones OSs(Windows Phone, Android, iOS, Blackberry), Development on Android OS, Application Fundamentals, User Interface, Working with Controllers, Working with Resources, Working with Sensors, Using Maps, Using Services, Localization. • **Industrial Lectures and Workshops**
Teaching Methodology	The course is structured around lectures (2 hours per week) and laboratories (2 hours per week) as well as group projects with final project presentation, laboratory exercises and individual work. During the lectures, students are encouraged to participate in discussions enabling the exchange of ideas and examples. Laboratory exercises are handed to students and their solutions are discussed at laboratory periods. Additional tutorial time at the end of each lecture is provided to students as well as additional notes for each section of the course and worksheets, which process in the lab or as homework. Students are expected to demonstrate the necessary effort to become confident with the different concepts and topics of the course. Lecture notes and presentations are available through the web (e-learning platform) for students to use in combination with the textbooks. Furthermore, theoretical principles are explained by means of specific examples and for solving specific problems using practical examples. Students are also advised to use the subject's textbook or reference books for further reading and practice.
Bibliography	<u>Textbooks:</u> • Professional Android 2 Application Development, Reto Meier, 576 pages, November, 2010 • Frank Adelstein, Sandeep KS Gupta, Golden Richard III and Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, Nov 30, 2004. • Enough Software Team, Mobile Developers Guide, 10th Edition, February 2012. • John Krumm, Ubiquitous Computing Fundamentals, CRC Press, 2010.

	• References: • Andreas Konstantinidis, Panagiotis Irakleous, Zacharias Georgiou, Demetrios Zeinalipour-Yazti and Panos K. Chrysanthis, "IoT Data Prefetching in Indoor Navigation SOAs" , ACM Transactions on Internet Technology (TOIT'18), 20 pages, 2018. • Andreas Konstantinidis, Georgios Chatzimilioudis, Demetrios Zeinalipour-Yazti, Paschalis Mpeis, Nikos Pelekis, Yannis Theodoridis, "Privacy-Preserving Indoor Localization on Smartphones." IEEE Transactions on Knowledge and Data Engineering (TKDE '15), IEEE Computer Society, USA, 2015. • Andreas Konstantinidis, Demetrios Zeinalipour-Yazti, Panayiotis Andreou, George Samaras, and Panos Chrysanthis, "Intelligent Search in Social Communities of Smartphone Users" , Distributed and Parallel Databases (DAPD '13), Springer Press, Vol: 31, No: 2 Pages: 115-149, 2013 • G. Larkou, P. Andreou, A. Konstantinidis, D. Zeinalipour-Yazti. "SmartLab: Empowering Mobile Computing Research through an Open Smartphone Cloud." ERCIM News 2013 Special Theme: Mobile Computing (93) (2013). • Konstantinidis, D. Zeinalipour-Yazti, P. Andreou, G. Samaras, and P. Chrysanthis, "Intelligent Search in Social Communities of Smartphone Users", Distributed and Parallel Databases, Springer, 2012. • G. Chatzimilioudis, A. Konstantinidis, C. Laoudias and D. Zeinalipour-Yazti,, "Crowdsourcing with Smartphones", IEEE Internet Computing, 2012. • Konstantinidis, Q. Zhang, K. Yang. “A Subproblem-dependent Heuristic in MOEA based on Decomposition for the Deployment and Power Assignment Problem in Wireless Sensor Networks”, 2009 IEEE Congress on Evolutionary Computation (CEC 2009), Norway. 2009. • Konstantinidis, K. Yang, Q. Zhang. “Problem-specific Encoding and Genetic Operation for a Multi-Objective Deployment and Power Assignment Problem in Wireless Sensor Networks”, IEEE ICC 2009, Germany, June 2009. • M Weiser, The Computer of the 21st century, Mobile Computing and Communications Review, Volume 3, Number 3, September 1991.
Assessment	The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final written exam. The coursework and the final exam grades are weighted 50% and 50%, respectively, and compose the final grade of the course. Various approaches are used for the continuous assessment of the students, such as mid-term test, class participation and laboratory work, group project design, implementation and presentation. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below: • **Mid-term Test** (15% of total marks for module) • **Participation Activities (Lab work)**(10% of total marks for module) • **One marked (group) project** (15% of total marks for

	module) • **Presentation of group project** (10% of total marks for module) • **One closed-book, 3-hours exam** (50% of total marks for module Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course.
Language	**English**