Zał. nr 4 do ZW 64/2012

FACULTY OF **ELECTRONICS**

SUBJECT CARD

Name in Polish:	**Programowanie aplikacyjne urządzeń mobilnych**
Name in English:	**Application Programming - Mobile Computing**
Main field of study:	**Computer Science**
Specialization:	**Internet Engineering**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**obligatory**
Subject code:	**INEA112**
Group of courses:	**YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	60		90		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course	X				
Number of ECTS points	5				
including number of ECTS points for practical (P) classes	-		3		
including number of ECTS points for direct teacher-student contact (BK) classes	1		2		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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SUBJECT OBJECTIVES

C1 Acquisition of knowledge about: construction, use, and typical applications of mobile consumer devices (multimedia phones, smartphones, tablets).

C2 The acquisition of specific knowledge about: the design and mobile application software aspects: mobile user interface, mobile communications, mobile networks, mobile databases, multimedia, embedded operating systems, embedded sensors and mobile security.

C3 Acquiring the ability to create applications for the selection of most popular mobile platforms (Android, Windows Phone and iOS).

C4 Acquiring the ability to carry out the full production cycle, of a distributed computer system, using mobile devices with the selected OS.

C5 Acquiring the ability of searching and self-studying the technical documentation of new systems and technologies in the field of mobile software.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01	knows the structure and characteristic hardware limitations of mobile devices
PEK_W02	is able to characterize and compare at least five different platforms, operating systems and programming IDE for mobile software development
PEK_W03	knows the principles of user interface design for smartphones and tablets
PEK_W04	has the knowledge of mobile databases
PEK_W05	has the knowledge of mobile telecommunications and mobile networks
PEK_W06	has the knowledge of typical sensors, embedded in mobile devices
PEK_W07	is familiar with security issues in distributed IT systems composed of mobile devices
PEK_W08	knows the principles of design and implementing a complex system using mobile devices.

relating to skills:

PEK_U01	is able to design and implement sample applications for at least three standard mobile platforms (Android, Windows Phone or iOS)
PEK_U02	Can use a selection of most popular development environments for mobile devices: Eclipse ADT, Android Studio, Visual Studio for Windows Phone, Xcode
PEK_U03	can implement the mobile database with SQLite standard
PEK_U04	can implement the mutual communication between mobile devices and a central server using TCP/IP standard
PEK_U05	can program the mobile communication (GSM / UMTS) unit, transmission of different messages: SMS, MMS and Email
PEK_U06	can program the embedded sensors (accelerometer, magnetometer, gyroscope, GPS) and utilize geomaping or geolocation services
PEK_U07	is able to prepare and configure the software distribution process through the online store (Google Play, Microsoft Marketplace or Apple App Store)

relating to social competences:

PEK_K01	recognizes the importance of information retrieval skills, and continuous studying of fast alternating field of mobile technologies.
PEK_K01	understands the need to develop the capacity for critical analysis and independent use of the acquired knowledge and skills.

PROGRAMME CONTENT

Form of classes – lecture		Number of hours
Lec 1	Introduction. Types of mobility. Characteristic features and hardware limitations of mobile devices. The evolution of mobile devices, networks and services. Overview of mobile platforms, operating systems, architectures and typical applications.	2
Lec 2	Google's Android operating system and programming environment. Open Handset Alliance. Android OS architecture. Standard components of Android application: Activity, Intent, Service, BroadcastReceiver, ContentProvider. The life cycle of application and cycle of Activity objects. Setting up the Eclipse development environment and Android SDK.	2
Lec 3	Android platform (part II). Design and implementation of a user interface (components: View, ViewGroup, XML Layouts, Widget). Possibilities of long-term data storage. Multimedia and network communication in an Android.	2
Lec 4	Android platform (part III). Android Intents and Filters, starting another Activity for result, build-in Intent handlers, multi-screen apps. Simple data archiving using preferences or XML files.	2
Lec 5	The operating system and programming environment of Apple's iOS platform.	2

	System architecture, Xcode IDE, Objective-C or Swift programming language. User interface design using Cocoa Touch, UIKit and Foundation Frameworks. procedure for the publication of programs and data in AppStore online shop.	
Lec 6	Developing applications for iOS (part II). MVC architecture. ViewController component life cycle. Multi-windowing applications: Storyboard, Segues, Master-Detail application pattern, UITableViewController.	2
Lec 7	The Microsoft Windows Phone mobile platform. Hardware specification of WP devices. Windows Phone ecosystem: Visual Studio, Expression Blend, the Zune software, Marketplace online shop. Silverlight technology: XAML, Metro Design, UI programming components, IsolatedStorage. Mobile database using LINQ.	2
Lec 8	Windows Phone OS - continuation. XNA technology. Creating 2D/3D games, graphics and animation for Windows Phone platform. Software publication in the Marketplace online shop.	2
Lec 9	Wireless telecommunication services. Evolution of radiotelephone hardware and communication systems. Wireless transmission media. Mobile networks: GSM, HSCSD, GPRS, EDGE, 3G, UMTS, HSDPA. Android Telephony API. Monitoring the state of SIM card and voice/data connections.	2
Lec 10	Bezprzewodowe i mobilne sieci komputerowe BAN, PAN, LAN. Standardy Bluetooth i WLAN IEEE 802.11. Topologie sieci mobilnych. Sieci 4G: WiMAX / IEEE 802.16, MBWA - IEEE802.20, LTE. Mobilne WWW: WAP, WML, WMLScript. Network connectivity and data transfer in Android environment using: sockets, TCP / IP / HTTP.	2
Lec 11	Security of mobile systems. Typical threats, vulnerabilities and scenarios of wireless attack. Security systems and technologies for mobile networks. Security of SmartCards and NFC transactions.	2
Lec 12	Mobile databases. Systems of local data storage in Flash memory and an SD card. Data synchronization in distributed IT systems. Overview of commercial mobile database solutions: SQLite, Sybase SQL Anywhere, MobiLink, UltraLite, UltraLite, UltraLiteC, IBM DB2 Everyplace.	2
Lec 13	Mobile Multimedia. Technology review, paradigms and services: NTT DoCoMo, i-mode service, SMS, MMS. Mobile TV technologies: unicast, streamed, broadcasted Mobile TV. DVB-H, DMB, MediaFLO, ISDB. Mobile TV in Poland.	2
Lec 14	Development trends in the field of mobile technology. Overview of prototype solutions: digital assistants, HyperAudio, on-line shoping, iGROCER, barcodes, NFC Memory Cards, Wireless Payments, MobileKey, Mobile Health Care, Nokia Mixed Reality, MIT's SixthSense.	2
Lec 15	Repetition and final test.	2
	Total hours	30

Form of classes - laboratory		**Number of hours**
Lab 1	Organizational activities. Overview of the lab exercises themes.	2
Lab 2	Android – introduction (Eclipse IDE, Android SDK, Java programming language)	2
Lab 3	Android – UI design for application composed of multiple activities	2
Lab 4	Android – implementation of a database using SQLite standard	2
Lab 5	Android – programming built-in sensors and telecommunication	2
Lab 6	Windows Phone - Introduction (Visual Studio IDE, C # programming language)	2
Lab 7	Windows Phone – practice handling orientation, Data Binding, switching between Pages and Navigation.	2
Lab 8	Windows Phone - implementing XNA games or 2D/3D animation.	2

	Preparing the application for public distribution (performance analysis, creating XAP file, creation of application tiles and artwork, Marketplace approval testing)	
Lab 9	Getting familiar with Apple iOS mobile platform and XCode IDE. Implementing single-screen "Currency Converter" application.	2
Lab 10	Studying the concept of ViewController in iOS ModelViewController architecture. Implementing all basic "life cycle" methods with NSLog(...) debug info. Using Segues to manage switching between windows (ViewControllers) in multi-screen iOS application.	2
Lab 11	Implementation of Master-Detail application pattern to display a brief list of items and detail ViewController to present individual information about selected item.	2
Lab 12	Concept development for the final laboratory project, for selected mobile platform. Software requirement specification and documentation with UML diagrams.	2
Lab 13	The implementation of the final project module for the selected mobile platform	2
Lab 14	Completing final project implementation. Software publication in on-line shop.	2
Lab 15	Discussion of the performed laboratory tasks and solutions. Presentation of selected projects in front of the group.	2
	Total hours	30

TEACHING TOOLS USED

N1. Traditional lecture using video projector.
N2. Individual work - development and implementation of introductory laboratory.
N3. Individual work - concept development, implementation and documentation of final laboratory task.
N4. Overview / code inspection made by the laboratory instructor.
N5. Presentation and discussion of prepared software in front of the group.
N6. Individual work - self-study and preparation for the written test.
N7. Individual consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01 – U05 PEK_U06 – U07 PEK_K01 – K02	Evaluation of introductory exercises (La2 ÷ La11). Inspection of created software code. Assessment of reports documenting the execution of tasks. Analysis of the concept and the technical documentation created by the student. Quality inspection of provided final project code, by the laboratory instructor.
F2	PEK_W01 – W08	Written test during the last lecture
P = 1/2*F1 + 1/2*F2; to successfully complete the course, both partial evaluations must be positive		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] W.F. Ableson, R. Sen, C. King, "Android in Action",
[2] S. Conder, L. Darcey: "Wireless Application Development ",
[3] S. Hashimi, S. Komatineni, D. MacLean, " Pro Android 2"
[4] R. Miles, "Windows Phone 8 Programming in C#",
[5] M. Piasecki, "Mobile Computing",
[6] T. Mikkonen, "Programming mobile devices: an introduction for practitioners"

SECONDARY LITERATURE:

[1] F. Fitzek, F. Reichert, "Mobile phone programming and its application to wireless networking",
[2] M. Ilyas ,I. Mahgoub, "Mobile computing handbook",
[3] A. Wigley, D. Moth, P. Foot, "Microsoft® Mobile Development Handbook".

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Marek Piasecki, marek.piasecki@pwr.wroc.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Application Programming - Mobile Computing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Computer Science**
AND SPECIALIZATION **Internet Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	S2INE_W12	C1	Lec1, Lec9, Lec10, Lec13, Lec14	N1, N2, N6
PEK_W02	S2INE_W12	C1, C2, C3	Lec1, Lec2, Lec5, Lec7	N1, N2, N6
PEK_W03	S2INE_W12	C2, C3	Lec1, Lec2, Lec3, Lec5, Lec7	N1, N2, N3
PEK_W04	S2INE_W12	C2, C3	Lec3, Lec7, Lec12,	N1, N2, N3, N6
PEK_W05	S2INE_W12	C2	Lec1, Lec9, Lec10,	N1, N2, N3
PEK_W06	S2INE_W12	C2, C3	Lec1, Lec2, Lec7, Lec14	N1, N2, N3, N6. N7
PEK_W07	S2INE_W12	C2	Lec1, Lec11,	N1, N2, N3, N7
PEK_W08	S2INE_W12	C4, C5	Lec1, Lec2, Lec5, Lec7	N1, N3, N4, N5, N6, N7
PEK_U01	S2INE_U17	C2, C3, C4	Lab2, Lab6, Lab9	N2, N7
PEK_U02	S2INE_U17, S2INE_U18	C2, C3, C4	Lab4, Lab7, Lab12	N2, N7
PEK_U03	S2INE_U17, S2INE_U18	C2	Lab7, Lab10, Lab13	N2, N3
PEK_U04	S2INE_U17, S2INE_U18	C2	Lab5, Lab13	N2, N3
PEK_U05	S2INE_U17	C2	Lab5, Lab13	N2, N3
PEK_U06	S2INE_U17	C2	Lab5, Lab13, La14	N2, N3
PEK_U07	S2INE_U18	C2, C3, C4	Lab8, Lab14	N2, N3, N6
PEK_K01	K2INF_K03	C5	Lec1, Lec14, Lab11, Lab12, Lab15	N1, N3, N5
PEK_K02	K2INF_K03	C5	Lec14, Lab12÷Lab15	N1, N3, N4, N5