

## Subject Description Form

<b>Subject Code</b>	LSGI541
<b>Subject Title</b>	Advanced Mobile GIS and LBS
<b>Credit Value</b>	3
<b>Level</b>	5
<b>Pre-requisite / Co-requisite/ Exclusion</b>	The students are expected to have basic knowledge in mobile GIS programming
<b>Objectives</b>	To provide the students with an understanding of mobile geographic information systems from the software engineering, data handling, and management point of view, together with the latest development of ubiquitous positioning, and a critical mind on designing an LBS application by integrating positioning technologies with GIS and computer programming techniques. It allows students to get a clear understanding of the issues to consider when working on mobile-based GIS applications.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. explain the concepts of mobile GIS programming;</li> <li>b. apply the latest mobile computing technologies and wireless positioning to themobile systems;</li> <li>c. confidently design and develop mobile GIS applications;</li> <li>d. critically analyze the appropriateness of positioning technology, GIS, anddata communication requirements in LBS applications;</li> <li>e. integrate the knowledge learned in this subject and design an LBS system;</li> <li>f. discuss future trends and developments, and potential applications of LBS.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ul style="list-style-type: none"> <li>• Mobile computing concepts <ul style="list-style-type: none"> <li>○ Mobile communication systems</li> <li>○ Multi-tier client/server computing model</li> </ul> </li> <li>• Data management and services in the mobile environment <ul style="list-style-type: none"> <li>○ Interoperability through standards</li> <li>○ Open source projects</li> <li>○ Security and privacy</li> <li>○ Use of free basic mapping providers (e.g. Google Maps, Yahoo Maps, Microsoft Bing) vs. in-house basic mapping content</li> </ul> </li> <li>• Integration of communication, positioning, and geospatial data management technologies to the mobile geospatial system (mobile GIS programming)</li> <li>• Modern Positioning Technologies for Location Based Services: Positioning algorithms, modern technologies for indoor and outdoor positioning (Global Positioning Systems, Wi-Fi, ZigBee), data collection, and computational methods of modern positioning technologies.</li> <li>• Location Based Services: History of LBS Development, LBS system integration.</li> </ul>

- Applications of LBS, Design of an LBS in the following application areas: Commercial applications, Intelligent Transportation Systems, Navigation and Guidance, Supply Chain and Logistics, Tourism.

**Teaching/Learning Methodology**

Background knowledge will first be addressed in formal lectures. Existing systems and research prototypes will be used to demonstrate concepts and principles of communication and positioning techniques. After students have acquired the necessary background knowledge, students will be facilitated discussions on strengths and weaknesses of different communications and data management scenarios for improving the performance and presentation results.

Learning approach: Lectures, Group Discussion, Laboratory, LBS Design Project.

**Assessment Methods in Alignment with Intended Learning Outcomes**

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
1. Assignments	40%	✓	✓				
2. Final Test	30%		✓	✓	✓		
3. Group Project	30%			✓	✓	✓	✓
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Student understanding of concepts and principles of mobile GIS systems, communication, and mobile geospatial data management will be assessed during the quiz and in-class discussion.

The in-depth study requires the students to look for and to discuss about the latest developments in the fields of mobile GIS. It will help them to understand and consolidate the basis of mobile GIS and the main issues in developing a mobile GIS application.

Students' ability of knowledge integration can be demonstrated in the process of project design, progress report, and the final submission. Appropriate questions set in phase test and literature review exercise will be able to assess students' critical thinking and understanding in outcomes d, e and f.

<b>Student Study Effort Expected</b>	<b>Class contact:</b>	
	▪ Lectures	26 Hrs.
	▪ Practical sessions	13 Hrs.
	<b>Other student study effort:</b>	
	▪ Lecture and lab preparations	20 Hrs.
	▪ Assignments and project	39 Hrs.
	▪ Self-study	13 Hrs.
	<b>Total student study effort:</b>	111 Hrs.
<b>Reading List and References</b>	<ul style="list-style-type: none"> <li>• Location based services and telecartography / [edited by] Georg Gartner, William Cartwright, Michael P. Peterson. Springer, 2007.</li> <li>• Location based services and telecartography II: from sensor fusion to context models: 5th International Conference on Location Based Services and TeleCartography 2008, Salzburg / Georg Gartner, Karl Rehr (Eds.). International Conference on Location Based Services and TeleCartography (5th : 2008 : Salzburg, Austria). Springer, 2009.</li> <li>• Location-based information systems: developing real-time tracking applications / Miguel A. Labrador, Alfredo J. Perez, Pedro M. Wightman. CRC Press, 2011.</li> <li>• Location-based services and geo-information engineering / Allan Brimicombe, Chao Li. Wiley-Blackwell, 2009.</li> <li>• Location-based services handbook: applications, technologies, and security / edited by Syed A. Ahson and Mohammad Ilyas. CRC Press, 2011.</li> <li>• Movement-aware applications for sustainable mobility: technologies and approaches / Monica Wachowicz, [editor]. Hershey, PA: Information Science Reference, 2010.</li> <li>• Shea, G.Y.K., Cao, J.N., 2010. Use of open source programs to create a foundation for developing serious GIS application on mobile device. Proceedings of the XXIV FIG International Congress, 11-16 April 2010, Sydney, Australia.</li> <li>• Shea, G.Y.K., Cao, J.N., 2012. Geo-Planar Indexing (GPI) - An efficient indexing scheme for fast retrieval of raster-based geospatial data in mobile GIS. In: Qianbin Chen, Qiang Cheng, Yongmin Li, Tianqi Zhang, and Lipo Wang (Eds.) Proceedings of the 5th International Congress on Image and Signal Processing (CISP 2012), pp. 798-803. 16-18 October 2012, Chongqing, China.</li> <li>• Shi, J.W.Z., Kwan, K.W., Shea, G.Y.K., Cao, J.N., 2009. A dynamic data model for mobile GIS. Computers &amp; Geosciences, Volume 35, Issue 11, pp. 2210-2221 (November 2009), Elsevier.</li> <li>• Jagoe, A. (2002), Mobile Location Based Services: Professional Developer Guide. Pearson Education.</li> <li>• Krzysztof W.K., J. Hielm (2006), Local Positioning Systems. LBS Applications and Services. Taylor &amp; Francis.</li> </ul>	

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|  | <ul style="list-style-type: none"><li>• MOK, E. (2007), "Ubiquitous Positioning Technologies and LBS", Location, Issue 04, Volume 02, July-August 2007, pp 36-40.</li><li>• Mok, E., G. Retscher (2007), "Location Determination Using WiFi Fingerprinting versus WiFi Trilateration", Journal of Location Based Services, Vol. 1, No. 2, June 2007 145-159.</li><li>• Mok, E., T. Hui, F.s Lau, L. Xia (2007), "Positioning Performance of Ultra-wide Band and ZigBee Technologies", Proceedings, IGNSS 2007 Symposium 2007, The University of New South Wales, Sydney, Australia 4 – 6 December, 2007 (CD-ROM) .</li><li>• MOK Esmond, YEUNG, Y.K. (2012). "ZigBee Network Positioning with Support of Real-time Kinematic GPS and Terrestrial Measurements". Survey Review, Available on-line 5th, Sept 2012.</li><li>• PUN, L., E. Mok et.al. (2007), "EASYGO-A public transport query and guiding LBS", Lecture Notes in Geoinformation and Cartography, Location Based Services and TeleCartography, Springer, pp. 545- 554.</li></ul> |
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