Subject Description Form

Subject Code	LSGI3245
Subject Title	**Geospatial Database Management and Design**
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The aim of this subject is to develop students' understanding on what a geospatial database is, the inherent data models, database management systems, and approaches to geospatial database design. It is also expected that students can critically review a spatial data management problem through the design and the implementation of a database in a mini project.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: A. Explain the concepts of geospatial database, data models and DBMS (L3) B. Implement and use a relational database in SQL (L3) C. Implement and use a geospatial database (L3) D. Design and critically analyse a geospatial database (L4)
Subject Synopsis/ Indicative Syllabus	**Relational Database Management Systems (35%)** Introduction to Database Management Systems; Relational data model, Relational algebra, Integrity; Structured Query Language (SQL); **Spatial Data Model and Schema (25%)** Object relational database; Spatial relationships; **Spatial Database Design (30%)** Normalisation; Conceptual design; Logical design; Introduction to physical design; **Spatial Database management (10%)** Introduction to database optimisation and Spatial Access Methods; Transactions; Centralised and distributed database;
Teaching/Learning Methodology	Lectures will introduce the subject materials on relational database, spatial database and database design concepts. Practical sessions will focus on hands-on experiences using open source RDBMS and SQL,

<table>
<tr><td></td><td>Python or C# (connection to a database server and development of a user interface) and PostGIS (spatial database) to strengthen students' practical and technical skills. Group project is designed to encourage students to acquire in-depth understanding of the development of a database application. The project should also help students to develop their creative and critical thinking as they have to design and set up their own application.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>1. Test 1</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Test 2</td><td>15%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Project</td><td>15%</td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>4. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
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Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment consists of three components: two phase tests and one group project. The first phase test assesses students' understanding of database systems and their abilities to manipulate data in a relational model. Second phase test assesses students' ability to query a database containing spatial information and their faculty to model an enterprise conceptually and to translate it in a relational model. Finally, students have to show their mastery of the subject in a group project where they have to study a scenario, design and implement a spatial database modelling this scenario. Please note that generative AI can only serve as a tool for assisting initial idea development and proofreading for project presentation and report, and any involvement of generative AI tools must be clearly acknowledged and referenced.

Final examination assesses students' independent skills of expression, as well as knowledge of spatial database concepts, design, and management.</td></tr>
<tr><td rowspan="3">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>▪ Practical works</td><td>26 Hrs.</td></tr>
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	Other student study effort:	
	▪ Preparation to lectures and practical works	15 Hrs.
	▪ Preparation to tests and project	38 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	Recommended: 1. A. Silberschatz, H. Korth and S. Sudarshan. "*Database System Concepts*" (7th ed.), McGraw-Hill Education, 2019, PolyU call number QA76.9.D3 K67 2020. (online resources available at https://www.db-book.com) 2. S. Shekhar and S. Chawla, "*Spatial Databases, a Tour"*, Prentice Hall, 2003, PolyU call number G70.212.S54 2003. 3. R. O. Obe and L. S. Hsu. "*PostGIS in Action*". Manning Publications Co, 2015, PolyU call number G70.212.O24 2015. 4. C. J. Date, "*An Introduction to Database Systems*" (8th ed.), Addison-Wesley, 2004, PolyU call number QA76.9.D3 D37 2004. 5. P. Rigaux, M. Scholl, A. Voisard, "*Spatial Databases with application to GIS*", Morgan Kaufmann, 2002, PolyU call number G70.212.R54 2002. 6. M. F. Worboys and M. Duckham, "*GIS, a Computing Perspective*", Second edition, CRC Press, 2004, PolyU call number G70.2.W66 2004. Supplementary: 1. A. K. W. Yeung and G. B. Hall, "*Spatial Database Systems – Design, Implementation and Project Management*", Springer, 2007, PolyU call number G70.212.Y38 2007eb (electronic resource) 2. PostgreSQL documentation website http://www.postgresql.org/docs 3. PostGIS documentation website http://postgis.net/documentation	