Subject Description Form

Subject Code	LSGI3230A
Subject Title	**Geomatics Algorithms and Programming**
Credit Value	3
Level	3
Pre-requisites	LSGI2223 Geographic Information Science; and COMP1012 Programming Fundamentals and Applications
Objectives	This subject focuses on advanced programming and algorithms for handling spatial data in geomatics application.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand principles of Geomatics programing (L1) b. Be familiar with typical Geomatics algorithms (L2) c. Confidently design and develop Geomatics applications (L3)
Subject Synopsis/ Indicative Syllabus	**Data structures (30%)** Object oriented programming Data containers Spatial and topological data structures **Algorithms for spatial data handling (40%)** Affine transformations Intersection and inclusion tests, distance computation Selection and smoothing algorithms Triangulation **Geomatics applications (20%)** Graphical user interface Levelling, traverse calculation Spatial relationships
Teaching/Learning Methodology	Lectures will introduce the different concepts required for programming geomatics applications (object-oriented programming,). Basic data structures (linked list, tree) and algorithms handling these structures will be presented during the lectures. Practical sessions will focus on hands-on experiences where students will manipulate the different object models and implement applications handling spatial data, including applications for surveying and GIS problems. Development of a geomatics application will also be addressed during the group project.

<table>
<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="3">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td></tr>
<tr><td>1. Assignment</td><td>15%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Phase test (Written)</td><td>25%</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Lab test (Coding)</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>4. Group project</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="3"></td></tr>
</table>
Student understanding of programming principles and geomatic algorithms will primarily be assessed through a phase test and a lab test. Additionally, the assignment is composed of two elements: design an algorithm to solve a particular geomatic problem and developing computer program for that algorithm. The group project will assess all components as students will have to develop a geomatics application for a GIS or surveying system. The project will be done in group so as to train the students to work in a team on a project development and to enhance their communication and organization skills.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>20 Hrs.**</td></tr>
<tr><td>▪ Practical sessions</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Lecture and lab preparations</td><td>10 Hrs.</td></tr>
<tr><td>▪ Assignments and project</td><td>40 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>109 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>
P. Rigaux, M. Scholl, A. Voisard, "Spatial Databases with application to GIS", Morgan Kaufmann, 2002, PolyU call number G70.212.R54 2002.

Singleton, A., & Arribas-Bel, D. (2021). Geographic data science. Geographical Analysis, 53(1), 61-75.

Goodchild, M. F., & Longley, P. A. (2021). Geographic information science. In Handbook of Regional Science (pp. 1597-1614). Berlin, Heidelberg: Springer Berlin Heidelberg.
</td></tr>
</table>

** 2 hours lecture for ten weeks (No lecture on 1st, 12th and 13th week)