Subject Description Form

Subject Code	LSGI2223
Subject Title	**Geographic Information Science**
Credit Value	3
Level	2
Pre-requisite/ **Co-requisite/** **Exclusion**	Nil
Objectives	This subject aims at presenting the fundamental concepts and principles of geographic information Sciences (GISc), including spatial modelling and analysis in GISc. It also provides an appreciation of the operation of Geographic Information Systems (GIS) software to carry out what have been learnt theoretically. Students' English communication and critical thinking will also be addressed through written assessments.
Intended Learning Outcomes	At the end of this subject students who gain a pass will be able to: 1. Grasp a general understanding of GISc concepts / theories (L1) 2. Master the operation of at least one GIS software (L1) 3. Able to construct a small spatial database with relevant attribute data, perform a simple analysis of spatial pattern and present results graphically (L1 & L2)
Subject Synopsis/ Indicative Syllabus	**A. Overview** Evolution of GIS, its development and relationships with other disciplines; an overview of the basic functions of GIS and how GIS is different from CAD and database systems. **B. Fundamental Principles of GISc** Recognition, abstraction and modelling the real world; uncertainty of spatial data quality; scale and generalization; georeference; spatial analysis. **C. Hardware and Software Components** The user interface, the database, the software, the storage devices, the digitizer, the scanner and the display devices. **D. Space model and Spatial Features** Space and its tessellations; nature of spatial features, their entities and relationships; interpreting different classes of features from maps.

	E. Management of attributes in database Difference between spatial and non-spatial attributes; procedures of tagging attributes to features and linking up attributes from different databases; use of primary identifier. **F. Spatial Data Structures** The structures of simple data types such as point, line, text and image; vector and raster representation of spatial features – comparison and conversion; symbolisation of spatial features; graphic editing. **G. Topological Data Structures** The need for topology; elementary graph theory; simple topological data structures; essence of topology building. **H. Spatial Query and Analysis** Use of retrieval functions to find spatial features and to obtain their attribute values; distance and area measurement; operation and basic algorithms for simple topological analysis, buffer zone generation and overlay analysis. **I. Data Modelling and Representation for Buildings (BIM)** Modelling of building and building components; solid model vs surface model; attribution of building components. **J. Applications of GIS** Urban planning, transport, environmental study, land management, Hong Kong digital map data, e.g. the Computerized Land Information System (CLIS) and its BMS, GIRS, CIS.
Teaching/Learning Methodology	Teaching and learning will largely be conducted through weekly lectures. The subject materials, work examples, useful web sites and required readings will be uploaded to the on-line platform for students' easy reference. The contact hours will be used for lecturing the theory and concepts, individual and group discussions. In addition, a timetable for specific topics will be scheduled and a quiz will be used as formative assessment in order to help students to further identify their strengths and weaknesses. Students' knowledge and practical skills will be developed in the assigned practical sessions. A written report along with series of data has to be produced. Upon completing these exercises, students will be able to grasp a basic but solid understanding of GIS concepts for further advanced GIS subjects in their later stages of studies.

<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>1</td><td>2</td><td>3</td></tr>
<tr><td>1. In-class practicals</td><td>40</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Quiz</td><td>10</td><td>✓</td><td></td><td></td></tr>
<tr><td>3. Examination</td><td>50</td><td>✓</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="3"></td></tr>
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Students' knowledge and skills will be continuously assessed with the practical exercises assigned each week, a quiz and end of semester examination aims at testing the basic concepts.

Students need to pass both continuous assessment and examination in order to pass the whole subject.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures</td><td>26 Hrs.</td></tr>
<tr><td>▪ Practicals</td><td>26 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self study, reading and revision</td><td>53 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>105 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>

1. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind (2015) *Geographic Information Science and Systems 4th Edition*; Wiley
2. Kang-tsung Chang (2018) *Introduction to Geographic Information Systems*; McGraw Hill
3. Michael Law & Amy Collins (2022) *Getting to Know ArcGIS Desktop 10.8;* Esri Press
4. Chang, K.T. (2002) *Introduction to Geographic Information Systems*, McGraw-Hill Higher Education.
5. Chen, Y.Q. & Lee, Y.C. (eds) (2001) *Geographical Data Acquisition*, Springer Wien New York.
6. Rhind, D. W. (1991) *Geographical Information System: Principles and Applications*, Harlow, Essex, England: Longman Scientific and

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	Technical; New York: Wiley. 7. Paul Longley, M. Goodchild, D. Rhind, and D. Maguire (1999) *Geographical Information System: Principles and Technical Issues*, New York: John Wiley & Sons, Inc.