Subject Description Form

Subject Code	LSGI3350A
Subject Title	**Hydrographic Surveying**
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject introduces the concept and technology of hydrographic surveying to students. Its purpose is to provide the necessary knowledge and practical instrument operational and data processing skills needed for them to confidently accomplish a bathymetric survey in the real world during a 4-day field camp at the end of the course. This subject also aims to develop students' critical and creative thinking, as well as cooperative attitudes and behavior to work with others.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. Explain the role that Hydrographic Surveying plays in the Geomatics Profession (L1) 2. Understand the basic principles and methods involved (L1) 3. Identify the appropriate techniques for different types of surveys (L2) 4. Operate the hydrographic instruments and process the surveying data (L2) 5. Read and interpret nautical charts and bathymetric drawings (L2) 6. Analyze the data collected from a survey and assess its quality against the project requirements (L3) 7. Discuss with classmates the different roles for a hydrographic surveyor on marine projects (L4)
Subject Synopsis/ Indicative Syllabus	**A. Introduction, Tides and Datums** Overview of hydrographic surveying concepts, bathymetric and nautical charts. Basic tidal theory, tidal observations and predictions, common types of recording tide gauges, different vertical datums, Hong Kong tides. **B. Soundings** Overview of depth data types, working principle of multibeam echo sounders, characteristics and nature of underwater acoustic signals, multibeam transducers, error sources and calibrations **C. Navigation and Position Fixing**

<table>
<tr><td></td><td>
Horizontal positioning methods and requirements, concept of line and surface of position, positioning and navigation using satellite positioning systems, differential GPS (DGPS) and real-time kinematic (RTK)

D. Planning and Data Processing
General considerations for planning of an inshore hydrographic survey, ground and track control, practical soundings in inshore and coastal surveys, data processing and chart compilation, hydrographic software packages for data collection, processing and plotting.

E. Marine Environmental Measurements
Methods of measuring and recording of currents, composition of the seabed, and solids in suspension.

F. Hydrographic Surveying in Various Engineering Projects
Applications of hydrographic surveying technique in various engineering projects will be demonstrated and discussed.

G. Field Practice and Camp
The students work in a small group environment and are encouraged to take their own initiatives in scheduling and managing the hydrographic survey and associated tasks.
</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>This subject promotes self-awareness and critical thinking through lectures and practicals. In class discussions and group projects, students are empowered to question their own and other team members. Students are encouraged to ask questions face to face or via emails. Students' practical skills will be developed through a series of practical exercises and site visits, and finally at the field camp. Students' abilities of critical thinking will be enhanced through discussing and solving various challenging problems in the subject.</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="7">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>1. Examination</td><td>33</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>2. Continuous Assessment</td><td>67</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="7"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Students' understanding on different expected learning outcomes will be assessed continuously with assignments. Students' practical ability will be continuously assessed with the "real-time performance" approach in field practical exercises. Students' development of critical and creative thinking
</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">will be particularly assessed through the challenging problems embedded in the final field camp.</td></tr>
<tr><td rowspan="8">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture/tutorial</td><td>20 Hrs.</td></tr>
<tr><td>▪ Practical work</td><td>16 Hrs.</td></tr>
<tr><td>▪ Field Camp</td><td>28 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self study, reading and homework</td><td>50 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>114 Hrs.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Reading List and References</td><td colspan="2">Textbook:
1. U.S. Army Corps of Engineers (2002), Hydrographic surveying, Dept. of the Army, U.S. Army Corps of Engineers.

Recommended Reading:
1. Huibert-Jan Lekkerkerk (2006),Handbook of offshore surveying, London: Clarkson Research Services Ltd
2. de Jong, C. D., Lachapelle, G., Skone, S. & Elema, I. A. (2002), Hydrography, Delft University Press, The Netherlands.
3. Ingham, A. E. (1992), Hydrography for the Surveyor and Engineer, 3rd Edition revised by Abbott V. J., Blackwell Science.
4. International Hydrographic Organisation (1998), IHO Standards for Hydrographic Surveying (S-44), IHB Monaco.
5. Loweth, R. P. (1997), Manual of Offshore Surveying for Geoscientists and Engineers Chapman & Hall.
6. Pugh, D. (2004), Changing Sea Levels – Effects of Tides, Weather and Climate, Cambridge University Press.</td></tr>
</table>

7. Sonnenberg, G. J. (1988), *Radar and Electronic Navigation,* Butterworths.

Supplementary Reading:

1. Ackroyd, N. (1994), *Global Navigation: A GPS User' s Guide,* Lloyd's of London
2. *Admiralty Manual of Hydrographic Surveying, Volume 1 & 2 (1987)*, Hydrographer of the Navy, H.M.S.O., London (UK).
3. Coates, R .F. W. (1990), *Underwater Acoustic Systems,* Macmillan
4. Ingham, A. E. (1975), *Sea Surveying*, J. Wiley.
5. Milne, P. H. (1980), *Underwater Engineering Surveys*, E & F.N. Spon.
6. Marreiros, J. P. R. (1998), Performance Analysis of GPS Attitude Determination in a Hydrographic Survey Launch, freely downloadable from http://gge.unb.ca/
7. Hourdakis, P.E. (1986), Design and Implementation of an Inshore Hydrographic Surveying System, freely downloadable from http://gge.unb.ca/
8. Hamilton, A.C., Nickerson, B., Masry S.E.(1984), The Expected Impact of the Electronic Chart on the Canadian Hydrographic Service, freely downloadable from http://gge.unb.ca/

Journals/Magazines:

1. Hydro INTERNATIONAL
2. International Ocean Systems
3. Lighthouse
4. Sea Technology (Free subscription)
5. The Hydrographic Journal
6. The International Hydrographic Review

Web Sites:

1. International Federation of Surveyors (FIG), Commission 4 - Hydrography.
2. International Hydrographic Organisation.
3. The Canadian Hydrographic Association.
4. The Hydrographic Society.
5. Various Manufacturers & Survey Companies, (see centre pages of Hydro INTERNATIONAL).