Subject Description Form

Subject Code	LSGI3333
Subject Title	**Photogrammetry**
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The purpose of this subject is to give an overview of the technology of photogrammetry to students studying across several streams. It will provide students with an overview of the technical aspects of extracting 3-dimensional data from photographs and an understanding of the applications of the technology in the world of geomatics. Airborne and terrestrial LASER scanning will also be introduced.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Accurately classify photogrammetry based on several different criteria (L3) b. Perform computations related to the planning of a simple aerial photogrammetric project and the analysis of a photogrammetric project (L2) c. Discuss the advantages and disadvantages of alternative mathematical models used in photogrammetric processes and how and when they should be applied (L2) d. Apply the principles of photogrammetry to produce an accurate topographic map from a stereopair of aerial photographs and a rendered 3-dimensional model of a chosen simple object (L3) e. Compare different photogrammetric products and make correct choices in their application (L2) f. Outline the concepts of airborne and terrestrial LASER scanning and articulate the difference between them and the equivalent photogrammetry techniques (L2)
Subject Synopsis/ Indicative Syllabus	<u>The concept of photogrammetry</u> Metric and non-metric applications. Sensor systems and image acquisition. Projections and imaging geometry. Classification of photogrammetry. Applications of photogrammetry. <u>Photogrammetric procedures</u> Interior orientation. Exterior orientation. Relative orientation.

<table>
<tr><td></td><td>Absolute orientation.
Digital photogrammetric processing.

<u>Aerial photogrammetry</u>
Strips and blocks.
Error propagation and mapping accuracy.
Aerotriangulation and bundle adjustment.
Photogrammetric products.

<u>Close-range photogrammetry</u>
Principles of close-range photogrammetry.
Applications of close-range photogrammetry.

<u>Laser scanning</u>
Principles of laser scanning.
Applications of laser scanning.

<u>Advanced topics in photogrammetry</u></td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Fundamental knowledge will be created through didactic lectures and prescribed reading. This approach is required as the scope of this subject is very broad. By guiding students through the subject they can focus on the relevant topics rather than have to recognise the boundaries themselves.

Concepts will be elaborated upon and reinforced through a series of group-based comprehensive (multi-week) practical tasks. Due to the relative complexity of the subject, it is necessary that integrated projects are used so students can experience for themselves complete processes.

Tutorials will be used to address specific learning problems and to fill-in identified knowledge gaps.</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="6">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><td>e</td><td>f</td></tr>
<tr><td>1. Practical tasks</td><td>40%</td><td></td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Phase test</td><td>10%</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Examination</td><td>50%</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: As photogrammetry is one of those "difficult" subject and requires students to think in a sometimes abstract way, the comprehensive practical tasks will allow them see how the various components work together to achieve the objective of extracting 3-dimensional data from photographs. As the two main approaches to image acquisition will be studied, students will gain an appreciation of the scope of application of photogrammetry. These practical tasks will also require students to demonstrate both analytical and written communication skills through the preparation of technical reports relating to their work. The reports themselves will require students to explain what was done and why various decisions or choices were made, thus providing an indication of how well they comprehend the fundamental principles involved. Tutorials will be conducted following the completion of each practical task and before submission of the report. The purpose of the tutorials is to encourage students to reflect on the work they have done and its relevance to the subject. The phase test will be held mid-semester to give students a benchmark against which they can assess their individual, rather than group, capabilities. Examination will be used to independently check that each student has taken responsibility for their own learning of the essential concepts. It also provides, through careful examination questions, a means to ensure the correct use of terminology and in-depth understanding of interrelated concepts.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	2.0 * 13 = 26 Hrs.
	▪ Tutorial and practical work	2.0 * 7 = 14 Hrs.
	Other student study effort:	
	▪ Preparation for tutorial classes	4 * 3 = 12 Hrs.
	▪ Preparation for practical reports	7 * 2 = 14 Hrs.
	▪ Self-study	3 * 13 = 39 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	**Textbook** Linder, W. (2006). *Digital photogrammetry. A practical course.* Springer-Verlag, Berlin. TA593 .L45 2006 and online via Library link.	

Mikhail, E.M., J.S. Bethel and J.C. McGlone (2001). *Introduction to modern photogrammetry*. John Wiley & Sons, New York. TR693 .M55 2001

Wolf, P.R. and B.A. Dewitt (2000). *Elements of photogrammetry with applications in GIS*. 3nd edition, McGraw-Hill. TR693 .W64 2000

Recommended

ASCE (1996). *Photogrammetric mapping*. American Society of Civil Engineers, New York. TA593.25 .P56 1996

Falkner, E. and D. Morgan (2002). *Aerial mapping: methods and applications*. Lewis Publishers, Boca Raton. TA593 .F34 2002.

Graham, R. and A. Koh (2002). *Digital aerial survey: theory and practice*. Whittles, Latheronwheel. TA593 .G73 2002

Kraus, K. (2000). *Photogrammetry: geometry from images and laser scans*. 2nd edn. Walter de Gruyter, Berlin. TR693 .K6813 2007

Luhmann, T., S. Robson, S. Kyle and I. Harley (2006). *Close range photogrammetry. Principles, methods and applications*. Whittles, Caithness. TR693 .L84 2006

McGlone, J.C. (ed) (2004). *Manual of Photogrammetry*. 5th edn. American Society of Photogrammetry, Falls Church. TA593 .A63 2004

Read, R. and R. Graham (2002). *Manual of aerial survey*. Whittles, Latheronwheel. TR810 .G67 2002

Vosselman, G. and H-G. Maas (2010). *Airborne and terrestrial laser scanning*. Whittles, Caithness. G70.6 .A37 2010

Warner, W.S., R.W. Graham and R.E. Read (1996). *Small format aerial photography*. Whittles, Caithness. TR810 .W37 1996

USACE (2002). *Photogrammetric mapping. Department of the Army, Washington, D.C. http://140.194.76.129/publications/eng-manuals/EM_1110-1-1000_sec/EM_1110-1-1000.pdf.*

Supplementary

Agfa (1996). *A guide to digital photography. Theory and basics*. Agfa-Gevaert, Belgium. TR267 .G85 1996

Ghosh, S.K. (1988). *Analytical photogrammetry*. Pergamon Press, New York. TR693 .G55 1988

Ghosh, S.K. (1968). *Theory of stereophotogrammetry*. Dept. of Geodetic Science, Ohio State University, Columbus. TR693 .G56

Hallert, B. (1960). *Photogrammetry, basic principles and general survey*. McGraw-Hill, New York. TR693 .H313

Moffitt, F.H., and E.M. Mikhail (1980). *Photogrammetry*. Harper & Row, New York. TA593 .M58 1980

Sandau, R. (ed) (2010). *Digital airborne camera. Introduction and technology.* Springer, Dordrecht. TA593.35 .D55 2010eb

Shan, J. and C.K. Toth (2009). *Topographic laser ranging and scanning*. CRC Press, Boca Raton. TA579 .T654 2009

Slama, C.C. (Ed.) (1980). *Manual of photogrammetry*. 4th edn. American Society of Photogrammetry, Falls Church. TA593 .A63 1980

Australian Journal of Geodesy, Photogrammetry and Surveying. Institution of Surveyors, Australia, Canberra. QB301 .A87

Geomatics Research Australasia. Institution of Surveyors, Australia,

	Canberra. QB301 .A87 *ITC Journal*. The International Institute for Aerial Survey and Earth Sciences, Enschede. TA593 .I54 *ISPRS Journal of Photogrammetry and Remote Sensing*. Elsevier, Amsterdam. TA593 .P52 *Journal of Spatial Science*. Spatial Sciences Institute Australia. Perth. G70.212 .J68 *Photogrammetric Record*. Photogrammetric Society, London. TR693 .P46 *Photogrammetric Engineering and Remote Sensing*. American Society of Photogrammetry, Falls Church. TA593 .P54