

SURV3350: Analysis of Observations

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	This course gives an introduction to probability and statistical inference. This is applied to the least squares adjustment of survey and levelling networks as well as to the estimation of the precision of the computed coordinates or heights. In addition, the application of least squares modelling to various areas of relevance to Surveyors is dealt with.
Academic Progress Requirements	Nil
Assumed Knowledge	Content covered in courses MATH1110, MATH1120, SURV1200 or SURV2210.
Contact Hours	Callaghan Computer Lab Face to Face On Campus 1 hour(s) per week(s) for 13 week(s) starting Week 1 Field Study Face to Face On Campus 4 hour(s) per week(s) for 1 week(s) Lecture Face to Face On Campus 3 hour(s) per week(s) for 13 week(s) starting Week 1 NOTE: The above distribution of contact hours may alter on a weekly basis and will be confirmed in the course outline handed to students in Week 1. Tutorial Face to Face On Campus 1 hour(s) per week(s) for 13 week(s) starting Week 1
Unit Weighting Workload	10 Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator	Callaghan Dr Mehdi Khaki Mehdi.Khaki@newcastle.edu.au (02) 4921 6626 Consultation: EA128
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	School of Engineering EAG02 EA Building Callaghan Seng-admin@newcastle.edu.au 9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday)

SYLLABUS

Course Content	<ul style="list-style-type: none">• Statistics applied to surveying.• Sampling distributions, confidence intervals, statistical tests.• Least squares adjustment by the condition and parametric methods.• Applications of least squares to simple problems.• Propagation of variance.• Absolute and relative error ellipses.• Pre-analysis of surveys, industrial applications of least squares, computer packages.
Course Learning Outcomes	<p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Translate a problem requiring the adjustment of field data to an analytical form2. Apply appropriate solution techniques for the adjustment of field data3. Solve adjustment problems with least squares techniques4. Evaluate the outcome of least squares adjustments5. Evaluate the precision of the adjustment outcomes6. Apply statistical concepts to surveying computations
Course Materials	<p>Lecture Materials:</p> <ul style="list-style-type: none">- Vol. 1: Least squares estimation, propagation of variance, error ellipses- Vol. 2: Probability and statistical inference- Additional notes that replace parts of Chapters in lecture notes <p>Note</p> <ul style="list-style-type: none">- All notes are available on Canvas.- The Vol.1 and Vol.2 are available for purchase on Callaghan Campus.- Students should be aware that the lecture notes Vol.1 and Vol.2 will be used as reference readings. The content that will be delivered is indicated in this course outline and is, in particular, listed in the timetable below. <p>Other Resources:</p> <ul style="list-style-type: none">- Software Excel, Matlab and StarNet.

Recommended Text:

- Wolf, P.R. and C. Ghilani (1997), Adjustment computations: Statistics and least squares in surveying and GIS. John Wiley and Sons. Inc.: New York, NY.
- Harvey, B.R. (2006) Practical Least Squares and Statistics for Surveyors, School of Surveying and Spatial Information Systems, The University of New South Wales, UNSW Sydney, NSW 2052, Australia.

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Assignment 1	As notified on the course Canvas site.	Individual	10%	1, 2, 3, 4
2	Assignment 2	As notified on the course Canvas site.	Group	25%	1, 2, 3, 4, 5, 6
3	Assignment 3	As notified on the course Canvas site.	Group	15%	1, 2, 3, 4, 5, 6
4	Final examination		Individual	50%	1, 2, 3, 4, 5, 6

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Assignment 1

Assessment Type Description

Written Assignment
Questions are related to random variables in probability and computations of reduced levels of a levelling network using the least squares adjustment. Students are required to perform the least squares adjustment using Excel and check the least squares estimates using software StarNet.

Weighting

10%

Due Date

As notified on the course Canvas site.

Submission Method

Online

Assessment Criteria

Understand the concepts and achieve correct solutions. Perform computations using correct data.

Return Method

Feedback Provided

Online - .

Assessment 2 - Assignment 2

Assessment Type Description

Written Assignment
Students will perform a field survey by teamwork, from which the measurements will be submitted and also used in assignment 2. Questions are related to the least squares adjustment of the measurements using Excel and check the results using software StarNet. Field survey and assignment questions takes 5% and 20% of marks, respectively. Field survey involves group work, but assignment should be individually completed.

Weighting

25%

Due Date

As notified on the course Canvas site.

Submission Method

Online

Assessment Criteria

Understand the concepts and achieve correct solutions. Perform computations using correct data.

Return Method

Feedback Provided

Online - .

Assessment 3 - Assignment 3

Assessment Type	Written Assignment
Description	Assignment 3 will continue Excel computations of assignment 2, but mainly focuses on the quality of least squares estimates, error analysis and statistical tests. Some output results from assignment 2 can be directly used in assignment 3. The results should be checked against those from StarNet.
Weighting	15%
Due Date	As notified on the course Canvas site.
Submission Method	Online
Assessment Criteria	Understand the concepts and achieve correct solutions.
Return Method	
Feedback Provided	Online - .

Assessment 4 - Final examination

Assessment Type	Formal Examination
Description	
Weighting	50%
Due Date	
Submission Method	Formal Exam
Assessment Criteria	
Return Method	
Feedback Provided	

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.

Course Evaluation	Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.
Oral Interviews (Vivas)	As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure . In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule .
Academic Misconduct	All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35 .
Adverse Circumstances	<p>The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:</p> <ol style="list-style-type: none">1. the assessment item is a major assessment item; or2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;3. you are requesting a change of placement; or4. the course has a compulsory attendance requirement. <p>Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at: https://policies.newcastle.edu.au/document/view-current.php?id=236</p>
Important Policy Information	The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

This course outline was approved by the Head of School on the 29/01/2024. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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