

GGE 2012
Advanced Surveying
Winter Term 2010-2011
Geodesy and Geomatics Engineering, University of New Brunswick

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<p>Contact Hours and Room Locations:</p> <p>Lectures: Tuesday and Thursday from 10.30 to 11: 20; Room HE-11, Head Hall</p> <p>Lab Sessions: One afternoon per week -- Tuesday, 2:30-5:20 p.m., HB-17 computer lab., Head Hall</p> <p>Equipment Room: H-125</p> <p>Textbook: Kavanagh, B. <i>Surveying Principles and Applications</i>, Seventh Edition, Prentice Hall, 2006, ISBN 0-13-118862-3.</p>	

Calendar Description

Advanced instrumentation, two- and three-dimensional co-ordinate computations and transformations, and route design and surveying. Theory and accuracy evaluation of optical, optical-mechanical, and electronic instrumentation and techniques. Introduction and detailed principles of using the Global Navigation Satellite System (GNSS).

Course Outline

- Introduction
Course objectives, outline, schedule, and lab sessions.
- Surveying Basics
Error sources, basic error propagation law, statistical metrics of errors, field notes.
- **Traversing:** methods, computations and field procedures

Method of traversing, field work (measuring angles, lengths and height differences, selecting stations, error sources), computing a traverse.

- **Trigonometric Heighting**

Basics, basic error propagation, auxiliary horizontal triangle, long distance trigonometric heighting, simultaneous reciprocal zenith angle, trigonometric height traversing.

- **Precision Levelling**

Influence of curvature and refraction, Peg Test and Kukkamaki's method, automatic level, errors in levelling, levelling loops (closed and open), digital level, laser level.

- **Angle Measurement: methods, instrumentation and field procedures**

Concepts, optical theodolite, Total Station, measuring horizontal and vertical angles.

- **Distance measurement: methods, instrumentation and field procedures**

Use of tapes, **EDM** and other means (laser range finder, invar wire and stadia instruments), Reflectorless EDM, laser scanning

- **Surveys and Mapping**

Topographic surveying (methods, control, field work and errors); digital terrain models, break lines/break areas; terrestrial laser scanners.

- **Global Navigation Satellite System (GNSS)** – review, applications, control provision.

Learning objectives

Upon successful completion of this course including individual Lab session, students should be able to:

- Competently book and reduce field observations.
- Observe a traverse using a Total Station.
- Carry out a Bowditch traverse adjustment.
- Understand and appreciate the errors in traversing.
- Understand the theory of error propagation.
- Differentiate between random, systematic and gross errors.
- Carry out, process and plot a topographic survey making use of a variety of field equipment
- Accurately height points by vertical angles and levelling.
- Appreciate the accuracy of different positioning methods.
- Discuss the different positioning methods available using GNSS.
- Create, adjust and analyse a GNSS survey control network.
- Discuss the capabilities and accuracies of terrestrial laser scanners.

GGE 2013

GGE 2012 is a pre-requisite for GGE 2013 (Practicum II). Students not passing GGE 2012 with a grade of C or lower will not usually be permitted to take GGE 2013 in the spring of 2011.

Reference Materials

GGE 2012 – Advanced Surveying, Lecture Notes, Department of Geodesy and Geomatics Engineering, University of New Brunswick. Downloadable from Blackboard or a website (<http://www.navleader.com>) by lecturer.

Kavanagh, B. *Surveying Principles and Applications*, Seventh Edition, Prentice Hall, 2006, ISBN 0-13-118862-3.

Kahmen, H. and W. Faig, *Surveying*. Available at Engineering Library, call No.: TA545. K37 (2003).

Muskett, J, *Site Surveying*, Blackwell Science Ltd, 1995. Available at Engineering Library, call No.: TA625 .M87.

Previous exams will be posted on Blackboard.

Supplementary materials will be distributed in class from time to time.

Prerequisites

GGE1001, STAT 2593.

Method of Assessment

The final grade will be calculated on the following basis:

- Labs, Assignments: 25%.
- Attendance: 5%. (both Lab. and Lecture)
- Mid-Term Test (45 minutes, closed book): 20%.
- Final Exam (3 hours, closed book): 50%.
- 2~3 minutes presentation: Pass/Fail – see below

Each student will also orally describe (in about 2~3 minutes) an interesting survey fact/topic/example at least loosely related to the syllabus. Not assessed, but required to be done. Powerpoint or similar software should not be used; however, whiteboard and overheads are okay if required.

Numerical marks are converted to letter grades according to:

A+	A	A-	B+	B	B-	C+	C	D	F
100-90	89-80	79-75	74-70	69-65	64-60	59-55	54-50	49-45	44-0

The conversions between letter grades and grade points are given in the Undergraduate Calendar. The Mid-Term test will cover all material including the week prior to the test. The Mid-Term test and the final examination will be closed book.

Students who have special needs are encouraged to contact the Coordinator of Services to Students with Disabilities (Tel: 453-3513), email: unbds@unb.ca

All-inclusive policy

At UNB we promote non-exclusion. That is, all students should feel welcome no matter what their gender, race, religion etc. Statements from students that could reasonably be interpreted to be against this policy will not be accepted – those students could be excluded from the class. To quote from the UNB General Regulations:

II. GENERAL REGULATIONS ON STUDENT NON-ACADEMIC CONDUCT

B. In accordance with the commitment set out in the University's Mission Statement to provide an environment conducive to the development of the whole person, all members of the University community - staff, faculty, students and administrators - have the right to work and/or study in an environment which affords them respect and dignity, and is free from danger, discrimination, harassment, intimidation, and behaviour which is destructive, disruptive, or unlawful.

C. students are expected to:

1. abide by University regulations;
2. respect the integrity of University programs and activities;
3. acknowledge the diversity of the University community and the freedom of all members to participate in University programs and activities;
4. promote the peaceful and safe enjoyment of University facilities by other members of the University and public;
5. conduct themselves at all times in a manner that will reflect credit on themselves and the University.

(from 2010-2011 Undergraduate Calendar;

UNB website <http://eservices.unb.ca/calendar/undergraduate/>, accessed Jan., 2011)

VIII. ACADEMIC OFFENCES

A. PLAGIARISM

Plagiarism includes:

1. quoting verbatim or almost verbatim from a source (such as copyrighted material, notes, letters, business entries, computer materials, etc.) without acknowledgment;
2. adopting someone else's line of thought, argument, arrangement, or supporting evidence (such as, for example, statistics, bibliographies, etc.) without indicating such dependence;
3. submitting someone else's work, in whatever form (film, workbook, artwork, computer materials, etc.) without acknowledgment;
4. knowingly representing as one's own work any idea of another.

NOTE: In courses which include group work, the instructor must define and warn against plagiarism in group work. Unless an act of plagiarism is identified clearly with an individual student or students, a penalty may be imposed on all members of the group.

Penalties for Deliberate Plagiarism

In a case of deliberate plagiarism, the penalties are:

First Offence: If the student does not appeal, or if, on appeal, the Committee upholds the instructor's decision:

1. A notation will be placed on the student's transcript of academic record concerning the academic offence. The length of time the notation appears on the student's transcript of academic record is to be decided when the penalty is imposed and will depend on the severity of the offence.
2. The student may be required to submit a satisfactory and genuine piece of work to replace the one involving plagiarism. If the assignment is not resubmitted or is unsatisfactory, the student will receive a grade of F (zero) in the course. **NOTE:** If this penalty is assessed, the period of time allowed for the submission of the work will be determined by the Registrar in consultation with the faculty member making the charge, and, where appropriate, the Committee.
3. The student will receive a grade of F (zero) on the piece of work and, depending on the severity of the offence, may receive a grade of F for the course.
4. Other penalties as outlined in penalties for Other Academic Offences may be imposed.

Subsequent Offence: In cases where the Committee considers that the student has plagiarized again:

1. The student will receive a grade of F in the course and a notation of the academic offence will appear on the student's transcript of record. The length of time the notation appears on the student's transcript of academic record is to be decided when the penalty is imposed.

2. Other penalties as outlined in penalties for Other Academic Offence may be imposed.

For further information on procedures for dealing with cases of plagiarism, students should refer to the regulations found on 2010-2011 Undergraduate Calendar (UNB website <http://eservices.unb.ca/calendar/undergraduate/>)

Student Feedback

Feedback from students is encouraged! Towards the end of this course you will have the opportunity to complete the official UNB feedback form, and a feedback form designed by me! There will also be another feedback form distributed after approximately 4 weeks. However, to encourage feedback before then, an anonymous account will setup at Blackboard.

Examples of feedback:

Hey! You're going way too fast.
Hey! You're going way too slow.
I just can't understand you with that weird accent.
Can't read your writing!
This course is awesome!
This course is brilliant!

How to address me

You can address me in a variety of ways – use the one that you feel most comfortable with.

Examples:

Yong-Won Ahn
Yong-Won
Mr. Ahn

Not acceptable: Oi! Hey, you!

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Week #	DAY	Tuesday	Thursday
1	Jan 04/06		Class Starts: Introduction / Syllabus
2	Jan 11/13	Surveying Basics, and field notes, booking and reductions.	Distance Measuring Techniques.
3	Jan 18/20	Control surveys and Levelling: traversing, eccentric station, Kukkamaki and Peg tests.	Precision Levelling: Errors and testing insts, digital and laser levels, Parallel Plate Micrometer
4	Jan 25/27	Heighting: barometric heighting. trigonometric heighting: reciprocal procedures. GNSS heighting	Methods of detail surveying; reflectless EDM, Satellite imagery, GNSS kinematics survey.
5	Feb 01/03	3D Terrestrial Laser Scanner: Introduction of CT, and different applications including Geomatics example. Error sources	Control surveys: traversing computation, balancing, resection and intersection methodology.
6	Feb 08/10	Errors, errors of measurement: Introduction of Galton Box.	Error propagation: Errors, Weighting, Correlation, Examples
7	Feb 15/17	Example of mapping project OR Introduction of historical surveying equipments; theodolite, prototype of EDM, first commercial grade hi-precision GPS-only receiver.	Mid-Term Test (provisional) 45 minutes, closed book (20%)
8	Feb 22/24	Contours, and Digital Elevation Model:,contouring, breaklines, breakareas, 3D perspectiveness.	Mid-term feedback & Example of a combined DTM creation
9	Mar 01/04	GNSS: history, different positioning system, configuration	GNSS Positioning Concept; 2D and 3D, differential GNSS positioning, various geodetic applications using GNSS
10	Mar 08/10	March Break!! - No Class	March Break!! - No Class
11	Mar 15/17	Planning GNSS surveys I: critical parameters on the field survey, antenna height, surveying methods.	Planning GNSS surveys II: GNSS orbits, Special talk about different GNSS cables.
12	Mar 22/24	Processing GNSS surveys: processing examples with TGO by Trimble and their analysis.	GNSS processing reports and methods: open discussion
13	Mar 29/31	GNSS control networks: frame definition, hierarchy of networks	GNSS error sources: ionosphere, troposphere, and mitigation methods
14	Apr 05/07	Department's GNSS research	Review class/feedback forms.

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LAB SCHEDULE

- Week 1 – Jan 04 (All Tuesday herein)
No Class; Class starts on Jan 06
- Week 2 - Jan. 11
Lady Beaverbrook Gym project reconnaissance
- Week 3 - Jan. 18
Instrument error correction. Equipment orientation, manual traverse computations.
- Week 4 - Jan. 25
Lady Beaverbrook Gym project
Due: Progress report
- Week 5 - Feb. 01
Lady Beaverbrook Gym project
Due: Progress report
- Week 6 - Feb. 08
Lady Beaverbrook Gym project
Due: Progress report
- Week 7 - Feb. 15
Lady Beaverbrook Gym project
Due: Progress report
- Week 8 - Feb. 22
Introduction to traversing software; MicroSurvey (or Terramodel by Trimble)
Due: Levelling report
- Week 9 – Mar. 01
Introduction to DTM software; MicroSurvey (or Terramodel, TGO by Trimble)
Due: Traverse report
- Week 10 – Mar. 08
March Break!! - No Lab.
- Week 11 - Mar. 15
Final plan instructional tutorial; MicroSurvey (or TGO by Trimble)
- Week 12 - Mar. 22
GNSS exercise
- Week 13 – Mar. 29
Software tutorial
- Week 14 - Apr. 05
Historic equipment
Due: GNSS exercise report and topographic survey report.
- Note:** We would like to keep the GNSS exercise time flexible over weeks 12-13 as it is held outdoors and hence the weather will dictate the scheduling.

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LAB Marking Scheme

Progress Report (4 x 25)	100
Traverse Report	200
Levelling Report	100
Topographic Survey	200
GNSS Exercise Report	300
Field Practice (organization, participation)	100
2-minute presentation	Pass/Fail
Attendance	100

TOTAL 1100

(Labs, Assignments: 1000, Attendance: 100)

Mid-Term Exam: Feb. 17 (provisional)
Final Exam: starts from April 09. (To be determined)

Reminder:

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Students Enrolled (21) – Credit/Auditor

01. Billard, Ryan Glenn
02. Burt, Mitchel Scott
03. Doiron, Joseph Alan
04. Frenette, Dane Andrew
05. Gilliss, Stephen Donald
06. Greene, Jacques David
07. Ketchum, Emmett
08. Kim, Danielle Dong-Hye Arum
09. King, Yung Fong
10. Lai, Chi Yuen
11. Mazier, Conner David
12. Michaud, Joel Richard
13. Parrott, Nicholas Earl
14. Pineros, Ricardo Alberto
15. Renaud, Tyler William
16. Rousselle, Melissa Marceline
17. Seabelo, Kamogelo William
18. Sheng, Michael Baier
19. Stidwill, Blake Andrew
20. Sun, Rui
21. Tang, Hui