York University
Faculty of Science and Engineering

SC/EATS 2620 4.0 and SC/ENG 2120 4.0

Fundamentals of Surveying

Winter 2009

Course Director

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Office Hours: *Tuesday*, 10:00 – 13:00 (10:00a.m. – 1:00p.m.)
and per appointment

Teaching Assistant

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Office Hours: TBD

Lectures

Thursdays, 15:30 – 18:30 (3:30p.m. – 6:30p.m.)
Room: VH3009

Laboratory exercises

Fridays, 12:30-15:30 (0:30p.m. – 3:30p.m.)
Room: PSE 020

Assessment

Lab Assignments	45%
Mid-term test	15%
Participation	5%
Final Exam	35%

Attention: Students, who miss maximum 3 lab assignments for any reason, will automatically prevent from passing this course without exception.

Grade System

≥90%	A+
80-89%	A
75-79%	B+
70-74%	B
65-69%	C+
60-64%	C
55-59%	D+
50-54%	D
40-49%	E
<39%	F

Final marks from weighted averages will be converted to letter grades according to the University's regulations

GENERAL COURSE INFORMATION

1. Objectives

- Familiarization with the fundamental concepts of surveying and mapping.
- Understanding of surveying methods, techniques, measurement errors and accuracies.
- Handling, taking care and testing of survey equipment both, in laboratory and field environments.
- Acquiring field expereince and developing skills on instrument use and on key survey operations.
- Developing skills in data collection, processing, and analysis via calculations, computer programming and technical drawing.
- Being capble of performing fundamental surveys in practice.

2. Format

Since every individual responds to different stimuli in his or her learning process, the presentation of the material will be done in a variety of ways. All of them will require work on your part to be effective. We will take a participative approach to learning. This means that faculty and students learn **together** by doing. We will learn **with** each other and **from** each other. **Therefore, we are all responsible for being prepared for class:**

- Lectures will be conducted in form of teaching, discussion and participation. Students are required to participate actively, and design and solve problems by synthesizing knowledge, experience and skills from previous courses.
- Each session will normally commence with a brief review of the concepts treated previously. New subject(s) will be presented immediately after the review, according to the tentative lecture schedule provided in this handout. **Participation** is an essential element of learning: It will be **encouraged** and **assessed**.
- Examples and instrument demos will always be given to understand the concepts.
- All sessions will based on, but not limited to the textbook. Additional materials may also be supplied by the instructor for further studies upon the potential needs. The students will be required to actively search relevant literature to further their knowledge.
- Students may be required to visit selected industrial companies in Geomatics Engineering.

The appointments will be arranged separately.

3. Laboratory Assignemnts and Exercises

- Laboratory assignments are most essential for the development of skills and experience. They will comprise a variety of activities that are usually required in the design, planning, execution, analysis and interpretation of data, and preparation of comprehensive reports.
- Laboratory exercises will be conducted in the lab or outside infield.
- Laboratory reports will have clear due dates. You are expected to describe your labs against the lab's objectives in details, and to summarize the results in reports.
- Participation in all laboratory exercises is **mandatory**.
- Grades for late laboratory reports will be decreased by 20% per day for each day overdue. Late lab reports must be handed in personally to your TA or INSTRUCTOR

4. Getting feedback on your progress

Feedback on your progress will be provided in four different ways:

- Each class session should give you a fair idea how well you have understood the relevant material.
- Laboratory exercises: You will be asked to execute mandatory laboratory assignments, to solve specific problems and to write reports. Your participation is essential and will be assessed.
- Mid-term test.
- Final exam.

5. Announcements

Announcements and information related to the course, such as special lectures, class cancellations, change of due dates, professional activities, Internet links, and others will be emailed to the students or announced in class. Please check regularly for up-to-date announcements and information.

ACADEMIC INTEGRITY

All students should take the time to acquaint themselves with the university's policy concerning academic integrity in courses. Cheating, plagiarsing amd making unauthorized multiple submissions of academic assignments are not allowed. You are all advised to read about this at http:/www.yorku.ca/academicintegrity ('For students' session), and to complete the Academic integrity tutorial at http:/www.yourku.ca/tutorial/academic integrity/. You should print the results page of your successful quiz and keep it for verification if asked.

Ethical behaviour must be observed at all times.

SAFETY IN LAB AND FIELD

No Job is so important and no service so urgent that we cannot take time to perform our work

safety. The following is not intended to be an all-inclusive capsule of safety requirements.

- Students comply with all safety regulations, policies of York University.
- Wear personal protective equipment in all designated areas or when otherwise directed to do so.
- Immediately report to TA or course Director if any safety incident occurs or may occur.
- Each individual in lab or in field has the responsibility and obligation to the other group members to work safely. If one sees another one perform an unsafe act, they should call this to the other person's attention, whether the unsafe act affects only the individual or the whole team.
- The equipment used has the potential to become very hazardous objects and must be properly secured for travel.
- The survey instruments used should be protected from any potential damage.

COURSE OUTLINE

1. Surveying and mapping
2. Field and office work
3. Concepts of error analysis
4. Distance measurements.
5. Levelling.
6. Angle and direction measurements.
7. Survey operations.
8. Control and topographic surveying.
9. Route surveying.
10. Construction surveying.

TEXT BOOKS

Anderson, MJ., and E.M. Mikhail (1998): ***Surveying – Theory and preactice***. McGraw-Hill, (7th edition), 1998. **Required**.

Wang, Jian-Guo (2007): ***Fundamentals of Surveying***, Lecture slides, Geomatics Engineering, York University, 2009.

SUGGESTED REFERENCES

1. Wolf, P.R., and C.D. Ghilani, (2002). Elementary Surveying. An Introduction to Geomatics. Prentice Hall, New Jersey (10th Edition).
2. Kavanagh, Barry F. (2007): Surveying with Construction Applications, 6th Edition, Prentice Hall, 2007.
3. Schofield, W. (2007): Engineering Surveying, 6th Edition, Elsevier Butterworth-Heinemann, New York, 2007.
4. Leick, A, (2004). GPS Satellite Surveying. John Wiley, New York (3rd Edition), 2004.

5. Ghilani, C.D. and Wolf, P.R. (2006), Adjustment Computations: - Spatial Data Analysis, John Wiley & Sons (4th edition), 2006.
6. Cole, G.M. and Harbin, A.L.(2006): Surveyor Reference Manual, 4th Edition, Professional Publications, INC, Belmont CA, 2006.

TENTATIVE CLASS & LABORATORY ASSIGNMENTS SCHEDULE

Winter Classes Start: Wendesday, March 04, 2009

Reading Week: Cancelled

Winter Classes End: Thursday, May 21, 2009

Date ***Subject***

Week 1: Thursday, March 05, 2009
Lecture: Introduction – Course Outline and Requirements
Surveying and Mapping (Chapter 1); field and office work (Chapter 3); Basics of error theory and error propagation.
Labotatory and Filed work #1: No lab is performed. But the time is reserved for a future indistrial visit.

Week 2: Thursday, March 12, 2009
Lecture: Distance Measurements (Chapter 4): tapping, equipment for tapping, taping on level & slope ground, error analysis in tapping; stadia method; electromagnetic distance measurement;
Labotatory and Filed work #2: taping: instruments and techniques

Week 3: Thursday, March 19, 2009
Lecture: Leveling: definitions, methods, instruments; principle of barometric leveling; trigonometric leveling; geodetic leveling, instruments, methods, error analysis, instrument care. (Chapter 5)
Labotatory and Filed work #3: leveling: equipment, tecniques, field observation and office data processing

Week 4: Thursday, March 26, 2009
Lecture: Angle and direction measurements: bearings, azimuths, megnetic compass; error analysis; theodelites; methods of measurement, errors, accuracies, testing, adjustment, calibration; instrument care. (Chapter 6)
Labotatory and Filed work #4: Angle measurements: instrumetns and techniques

Week 5: Thursday, April 02, 2009
Lecture: Combined distance and angular measurements: Total station instruments, instrument use, instrument care, analysis of error sources Chapter 7).
Labotatory and Filed work #5: Total stations: instruments and techniques.

Week 6: Thursday, April 09, 2009
Lecture: Traversing: introduction, types of trverses, field procedures, error analysis of the traverse, adjustment of the traveres, methods of determining area. (Chapter 8)
Labotatory and Filed work #6: Travsing: planning, field observation and office data processing.

Week 7: Thursday, April 16, 2009

Lecture: Mid-Term test (90min); Other methods of horizontal poistioing: intersection, resection and their calculation, erorr and accuracies; introduction to triangulation, trilateration and combined networks (Chapter 9)

Labotatory and Filed work #7: Control Surveys - Intersection and resection: planning, field observation and office data processing.

Week 8: Thursday, April 23, 2009

Lecture: Topographical mapping: concepts, reference systems, datums; representation of relief, map symbols and drawing, digital terrain models (Chapter 14).

Labotatory and Filed work #8: Topographic mapping: lab exercise and drawing.

Week 9: Thursday, April 30, 2009

Lecture: Control and topo surveys: concepts, planning and establishing geodetic control; horizontal and vertical control surveys; topographic surveys (Chpater 15).

Labotatory and Filed work #9: Topographic mapping: field exercise and drawing.

Week 10: Thursday, May 07, 2009

Lecture: Route Surveys: route curves; circular curves, circular curve calculation and laying out; compund curves; spirals, spiral curve calculation and laying out; vertical curves; earthwork operations (Chapter 16).

Labotatory and Filed work #10: Topographic mapping: field exercise and drawing.

Week 11: Thursday, Mar. 14, 2009

Lecture: Construction surveys: general; specialized equipment; horizontal and vertical control; layout; As-built surveys; monotoring surveys; error sources (Chapter 17).

Labotatory and Filed work #11: Construction surveys – route layout: plan, control surveys and calculation.

Week 12: Thursday, May 21, 2009

Lecture: introduction to land surveys and supplemetory topics/Course review

Labotatory and Filed work #11 (cont'd): Construction surveys – route layout: staking out the planed route.

Fundamentals of Surveying

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Appendix 7a: Data Collection Procedures for the Total Station (16 pages)
Appendix 7b: SOKKIA SRX Total Station (10 pages)

Chapter 8 Control Surveys (47 slides)

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