Online Least Squares Adjustments Course Syllabus

This course was created and is being provided by BitWise Ideas Inc (see http://bitwiseideas.com/ for details).

The instructor for this course is Dr. Robin R. Steeves, author of GeoLab (see http://www.bitwiseideas.com/President.htm for more information about Dr. Steeves).

Course Description

This course covers the theory and practice of least squares adjustments and analysis as applied to surveying and geodetic networks and traverses of various types.

Both introductory and advanced theory are covered. Both simple and advanced practical applications are demonstrated using GeoLab, providing hands-on learning.

The course is divided into 16 weeks, with each week covering one of 16 major topics (see the list of major topics below).

Each week, a new set of lessons, course material, and instructions will be made available to each registrant (notification will be by email).

The course work for each week may be completed at any time during the week or two after the week of the lesson.

There will be four exams during the course (one after each four-week period), which must be completed satisfactorily to receive a certificate of successful completion. Each of these exams will take place after the corresponding course lessons and assignements are completed for the four-week period.

An estimated minimum of 6 to 8 hours per week will be required from participants.

Registrants are responsible for ordering their own text book prior to the beginning of the course (see textbook details below).

Course Material and Examinations

The following material will be used in this course:

- **Textbook**: "Adjustment Computations - Spatial Data Analysis", fifth edition, by Charles D. Ghilani, 2010, ISBN 978-0-470-46491-5 (cloth). This textbook can be purchased at amazon.com or amazon.ca.

- **Other material**: Study guides, material complementary to the textbook, examples, demonstration videos, etc.) will be provided through the online course site. The online password-protected course site is at: http://www.screencast.com/users/BitWiseIdeasInc/folders/Adjustments.

- **Personal one-on-one guidance** from Dr. Steeves will be handled by email.

Four exams (each contributing equally to the final grade for the course) will cover the content of each quarter (4 weeks) of the course. Examinations will consist of a number of true/false questions, and a number of multiple-choice questions.

Course Content

The major topics covered in the 16 weeks of this online course are as follows:

Week 01. Introduction to Statistics

Week 02. Random Error Theory

Week 03. Statistical Testing

Week 04. Propagation of Errors

Week 05. Introduction to Matrices

Week 06. Principles of Least Squares

Week 07. Observations, Conditions, and Constraints

Week 08. Nonlinear Equations and Taylor's Series

Week 09. The Normal Equations and Residuals

Week 10. GeoLab Overview

Week 11. Adjustment of Leveling Networks

Week 12. Adjustment of Horizontal and 3D Networks

Week 13. Performing Adjustments with GeoLab

Week 14. Optimization of Calculations

Week 15. Analyzing Adjustments with GeoLab

Week 16. Advanced GeoLab Procedures

The study of each of these topics will include:

- Study of an assigned portion of the course textbook.
- Study and practice of exercises pertaining to the material covered.
- Asking questions then receiving and studying responses from Dr. Steeves.