Course Title: Advanced Theory of Errors

Basic Information for the Course	
Academic Unit:	Faculty of Civil Engineering
Course Title:	Advanced Theory of Errors
Study Level:	Master
Course Status:	Mandatory
Year of Study:	Year I, Sem II
Number of hour per year:	2+2
ECTS:	6 ECTS
Time / Venue:	According to the timetable
Course Teacher:	Prof. Dr. Murat Meha
Contact Details:	Email: murat.meha@uni-pr.edu
Course Description:	Theory of errors and least squares adjustment is an important subject within the geomatics program offered at KTH. This is due to the fact that surveying and mapping (or production of spatial data) often requires mathematical processing of measurement data. Furthermore, the general methodology of spatial data processing is essentially the same as that for data processing in other science and engineering fields, even though data collection procedures and data types can be different. Theory of errors is related and comparable with what is called estimation theory used in automatic control and signal processing.
Course Objectives:	The course aims to teach in advanced level of Theory of Errors and methods.
Learning Outcomes:	After completing the course the student should: - Define the relation between measurements and errors in all surveying processes. - Discuss reasons why the theory of errors is necessary, before the recognition of the final results from the geodetic measurements, - Recognize problems and define the adjustment method, - Be able to simulate and compare adjustment methods, - Be able to evaluate results and define the residuals, - Support effectively decisions of the final results
The actuality and the importance of the course:	The actuality and the importance of the course Advanced Theory of Errors within the equalizations in geodesy represents and assures high level of geodetic measuring accuracy.

Student Workload (Consistent with the Learning Outcomes)			
Activity	**Hours**	**Day/Week**	**Total**

Lectures	2	15	30
Theory/Lab work/Exercises	2	15	30
Practical Work			
Preparation for intermediary test	3	2	6
Consultation with the teacher	2	10	20
Field work			
Colloquium, Seminars	4	4	16
Homework			
Self-study Time (in the Library or at Home)	2	7	14
Final exam preparation	6	2	12
Evaluations (Tests, Quiz, Final exam)	3	2	6
Projects, Presentations, etc.	8	2	16
Add other activities that do not meet on the table...			
Total			**150**

Teaching Methodology:	- *Lecture* - *Discussion during lectures* - *Exercises* - *Work in group*
Evaluation Methods:	In evaluation, the percentage of the attendance of each partial evaluation in the final evaluation must be determined. One of the ways of evaluation would be: First valuation: 25% Second Valuation: 25% Homework: 10% Attendance: 10% Final Exam: 30% Total: 100%

Basic Literature:	*1) K. T. Chang: Introduction to Geographic Information Systems, Mc Graw-Hill International Edition, 6th Edition, 2011, p. 432* *2) M. de Smith - P. Longley - M. Goodchild: Geospatial Analysis - A comprehensive guide, Winchelsea Press, 4th Edition, 2012, p. 34*
Additional Literature:	P. Longley et al.: Geographic Information Systems and Science, 2nd Edition, John Wiley & Sons Ltd., 2005. p. 517

Course Plan

Week	Title of the lecture
Java 1:	Observations and measurements, true value, measured values.
Java 2:	Evaluate the accuracy of the measured values. The processing and evaluation of distribution of a series of errors.
Java 3:	Free network adjustment and its interpretations
Java 4:	Valuation of the accuracy of measurements with different care
Java 5:	Actions on the magnitudes of the measured. Sense on the measured magnitudes. Collection laws errors.

Java 6:	Mathematical processing of geodetic measured values.
Java 7:	Sense of the evaluation accuracy in geodetic instruments as TS, GPS.
Java 8:	First evaluation
	The qualifying first colloquium
Java 9:	Matrix
Java 10:	Inverse matrix, the minimum rate of inverse.
Java 11:	Inverse matrix, the minimum rate of inverse.
Java 12:	Gross error detection. Data snooping
Java 13:	Concept of reliability
Java 14:	Project work is to adjust and analyse a two-dimensional triangulation network
Java 15:	Second evaluation.The qualifying second colloquium
Academic Policies and Rules of Civility:	

We start and finish class on time.
Tools used during class must be cleaned and stored away at the end of class.
Mobile/smart phones, and other electronic devices (e.g. iPods) must be turned off (or on vibrate) and hidden from view during class time.
Laptop and tablet computers are allowed for quiet use only; other activities such as checking personal e-mail or browsing the Internet are prohibited.

Notice |If 3 classroom exercises of one student are evaluated under 50% than he/she will lose the right to attend the final exam. The evaluation will be done from 0-100%.