

# PhD Course: Advanced Statistics

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## 1 Course Contents and Objective

The course provides

1. a profound data analysis using descriptive statistic,
2. a 'repetition' of important statistical concepts as for example  $p$ -value, significance level, power analysis, hypothesis, ...,
3. the statistical correct application of the Classical Multiple Linear Regression Model,
4. an introduction to advanced statistical methods (Analysis of Variance, Cluster Analysis, Discriminant Analysis or Factor Analysis).

Having an idea of the methods you may use in your research helps you to design your study statistically in the best way. Therefore, the methods are also discussed in order to show you how the knowledge of the approach can help to assess experiments appropriately.

The goal of the course is manifold:

- Statistical concepts and methods are discussed and you get an idea which kind of problems are solvable with statistics.
- Checking the assumptions underlying the statistical approaches is important in order to obtain valid results or to adapt your model. Therefore, the examination of the model prerequisites represents a relevant task in our course.
- A focus is put on the correct interpretation of the results obtained by the applied methods.
- You should recognize the constraints of statistics and the importance of theoretical substance.

**Note:** On the homepage of our course: PhD course 'Advanced Statistics' you will find all updates, news and downloadable materials e.g., slides or assignments.

**Note:** As few as possible formulae will be used. However, it is necessary to teach formulae so that you understand the basic concepts and are able to work autonomously in your future research.

## 2 Course Schedule

The course takes place during the summer semester 2011 at the SoWi, University of Innsbruck<sup>1</sup> and is blocked on four Fridays. The exact time and location is in the following table:

Day	Date	Time	Room
Friday	2010/03/18	8:30-12:00, 13:00-15:30	SR 7 (SoWi)*
Friday	2010/04/01	8:30-12:00, 13:00-15:30	SR 7 (SoWi)*
Friday	2010/04/15	8:30-12:00, 13:00-15:30	SR 7 (SoWi)*
Friday	2011/05/06	8:30-12:00, 13:00-15:30	SR 7 (SoWi)*

In the morning the lecture takes place and in the afternoon the methods will be applied to data sets and the results discussed in detail. As software package we will use SPSS.

## 3 Workload and Grading

- After each lecture day you will get an assignment with small problems to solve and to hand them in three days before the next lecture. For this exercise **50%** can be achieved.
- The final exam will be worth **50%** of the grade. The exam will last 90 minutes. In order to get a positive grading half of the points of the final exam must be achieved.  
The final exam will be held on Friday, May 20, 2011, 9:00 - 11:00 am, SR 7 (SoWi).

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<sup>1</sup>University of Innsbruck (SoWi), 2nd floor, East, Universitaetsstr. 15, A-6020 Innsbruck

Grading is as follows:

Result	Grade
< 55%	fail
55% – 65%	4
65% – 75%	3
75% – 85%	2
> 85%	1

## 4 Literature

- Hair J.F., Anderson R.E., Tatham R.L., Black W.C. (1998). *Multivariate Data Analysis*. Prentice Hall, London. pp 730.
- Legendre P., Legendre L. (1998). *Numerical Ecology*. Elsevier, Amsterdam pp 853.
- Tutz G., Fahrmeir L. (2001). *Multivariate Statistical Modelling Based on Generalized Linear Models*. Springer Series in Statistics, Berlin pp 548.
- Krebs C.J. (1989). *Ecological Methodology*. Harper & Row, New York. pp 654.
- Magnusson W.E., Mourão G. (2004). *Statistics without math*. Sinauer, Sunderland. pp 136.