Instructor: Wolfgang Hörmann

**Objective:** This course will give the mathematical basis necessary to understand the classical approaches of statistical inference. In parallel we will apply the learned methods to data sets using the statistical package “R”.

**Prerequisites:** Undergraduate probability and statistic. Calculus and Linear algebra.

**Week 1:** Introduction to R; revision of applications using confidence intervals and tests  
**Week 2:** The likelihood principle and sufficient statistics  
**Week 3:** Maximum likelihood estimation and Fisher information  
**Week 4:** Properties of MLE and Cramer-Rao’s lower bound  
**Week 5:** The Neyman-Pearson approach and the general likelihood ratio test  
**Week 6:** Applications of the likelihood ratio test  
**Week 7:** Linear Models, the general framework  
**Week 8:** Linear Models, Regression Applications  
**Week 9:** Linear Models, Analysis of Variance  
**Week 10:** Applied Statistics, Model Assumptions vs Data Mining Paradigm  
**Week 11:** Generalized linear Models and logistic regression

**Text Book:** Lecture Notes  
Other useful books:  
Adelchi Azzalini: Statistical inference : based on the likelihood  
R.E. Walpole and R.H. Meyers: Probability and Statistics for Engineers and Scientists  
(useful for most of the applied examples)

**Course Hours and Rooms:** the course hours will include lectures, solving of new problems, discussing the solution of new HW questions, Quizzes (sometimes announced, sometimes not announced).

**Homework:** Every week there will be  
- reading assignments (= material in the lecture notes that must be prepared till the next course)  
- mathematical HW questions  
- sometimes also computer assignments  
It is important that you try to make all HW questions!!!  
The quizzes will often contain questions very similar to the HW questions.  
Of the 6 quizzes the one with the lowest points (or the one you missed) will be not counted. There will be accepted no excuses for not attending a quiz.

**Grading:** mid-term tests (25 %), final exam (40 %) and a data-project (15%). 6 Quizzes (20%)

Moodle Course page: [http://moodle.ie.boun.edu.tr/](http://moodle.ie.boun.edu.tr/)  
Enrollment key: likelihood